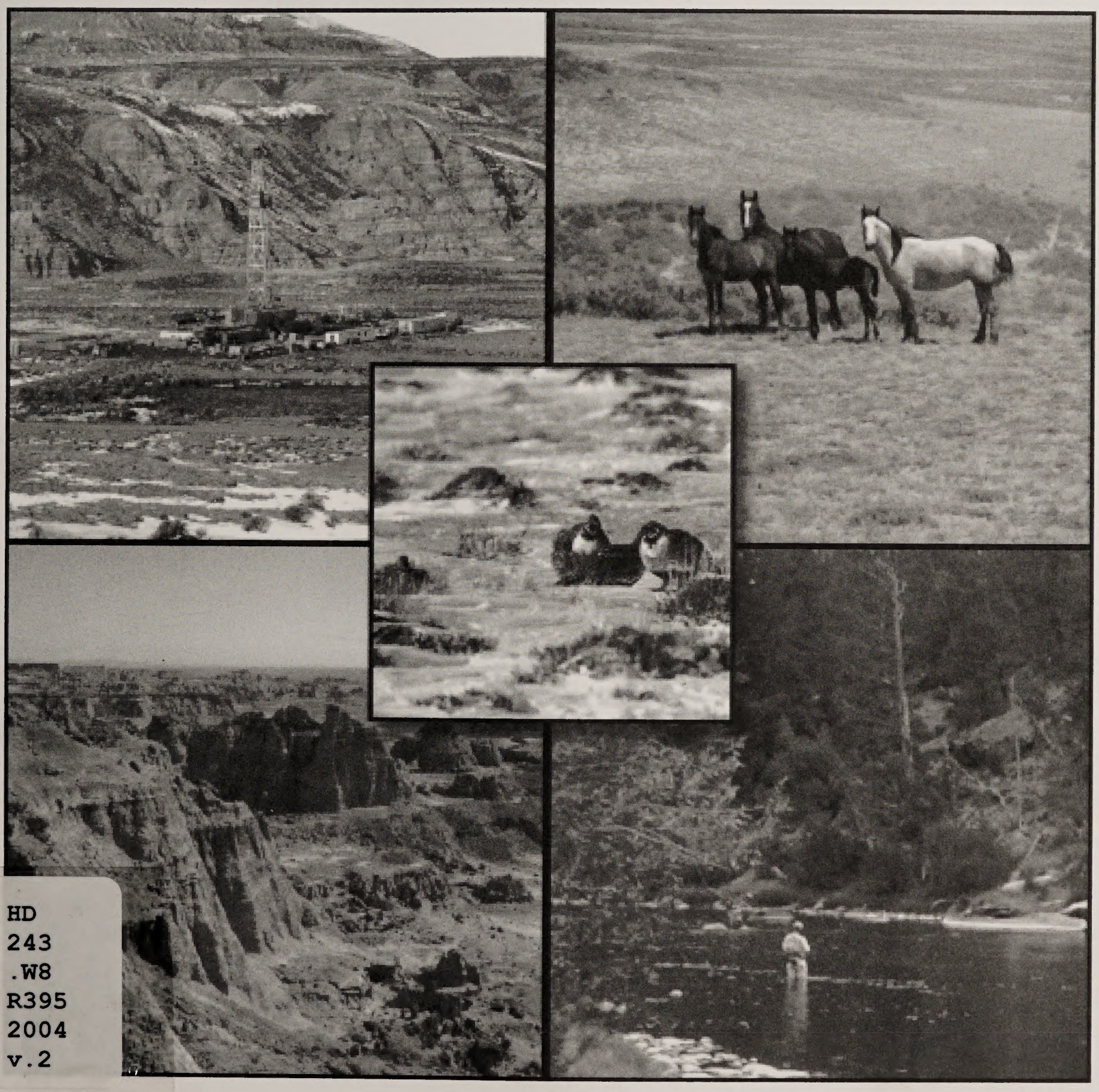
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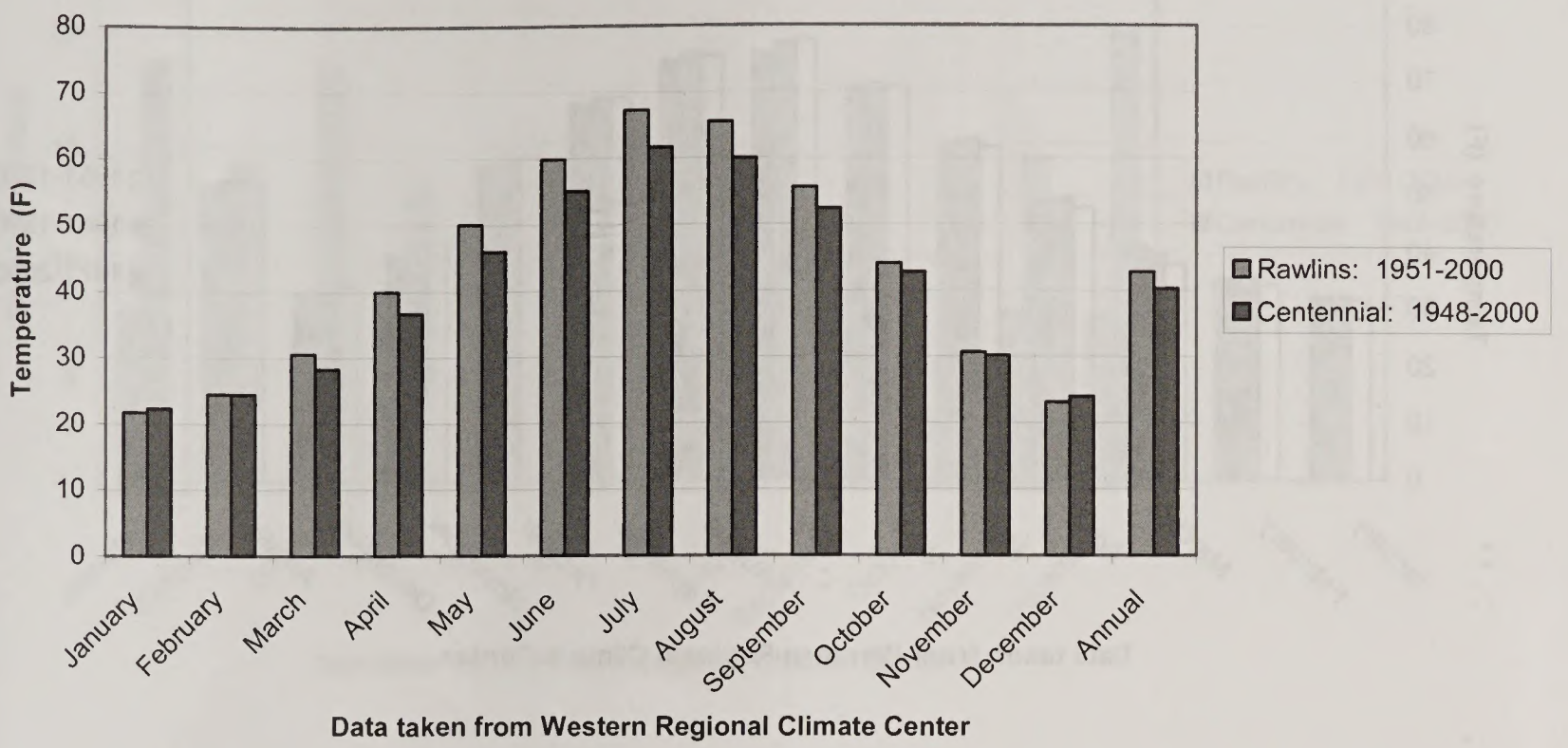
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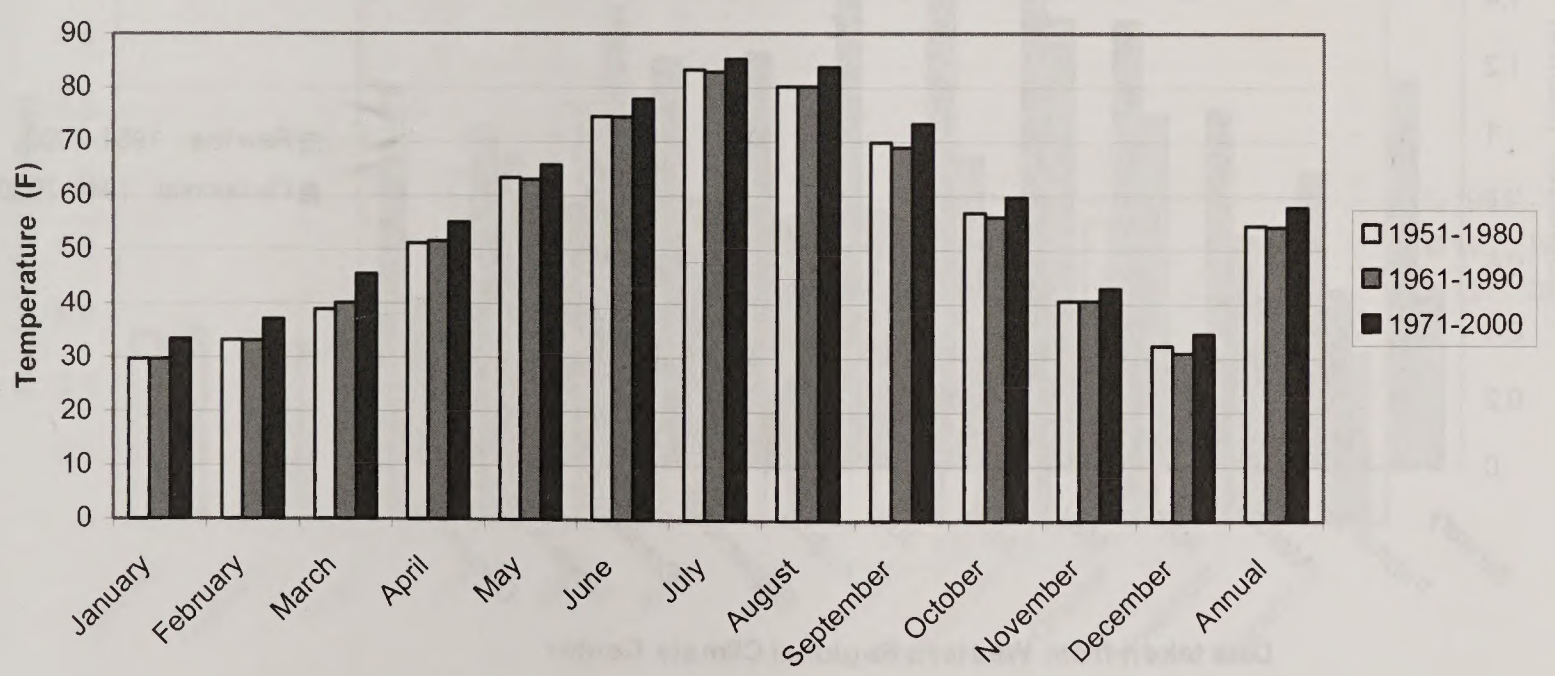
FIGURES

Figure 3-1 Mean Monthly Temperatures in the Rawlins RMPPA



Data taken from Western Regional Climate Center

Figure 3-2 Mean Monthly Maximum Temperatures near Rawlins, Wyoming



Data taken from Western Regional Climate Center:

Figure 3-3 Mean Monthly Maximum Temperatures near Centennial, Wyoming

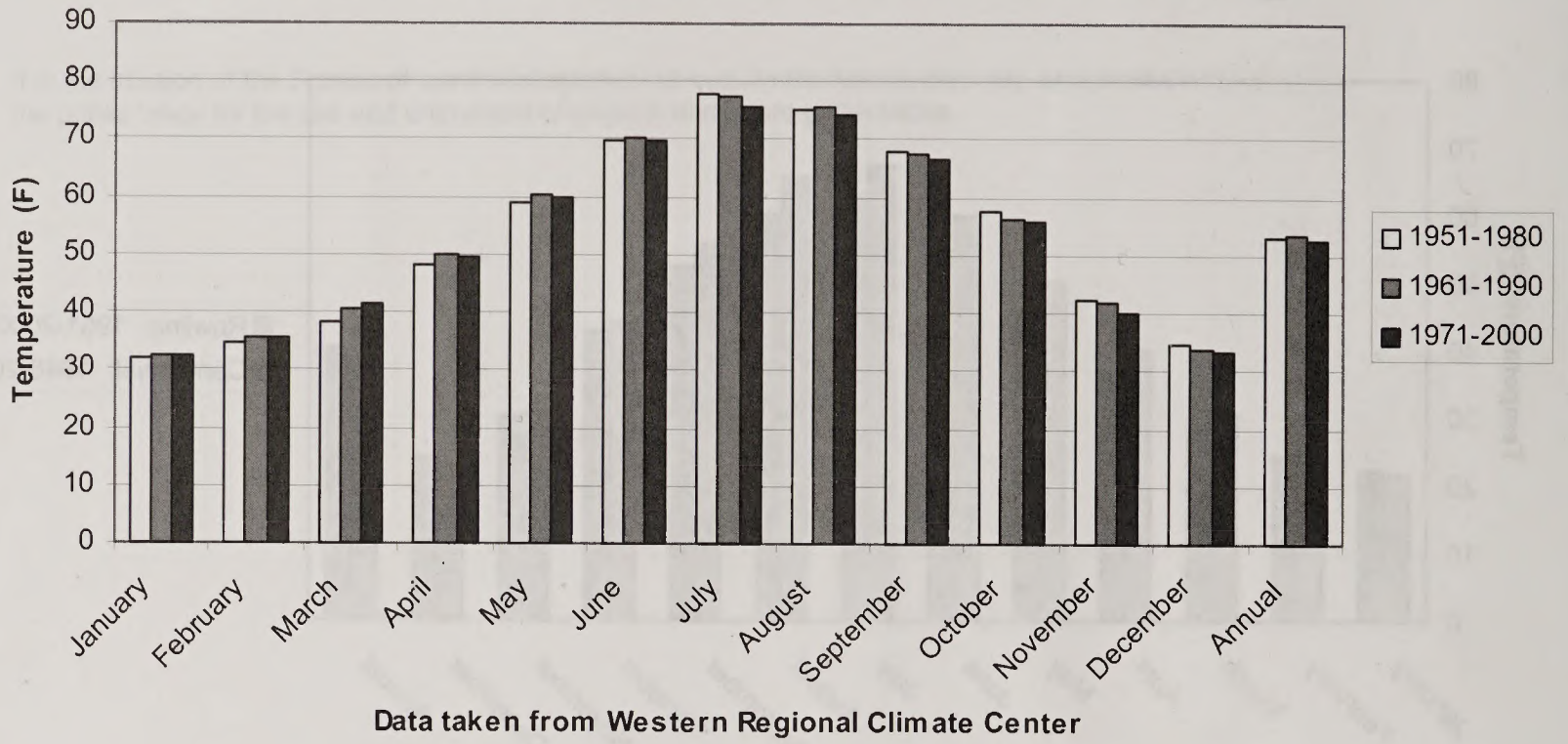


Figure 3-4 Mean Monthly Precipitation in the Rawlins RMPPA

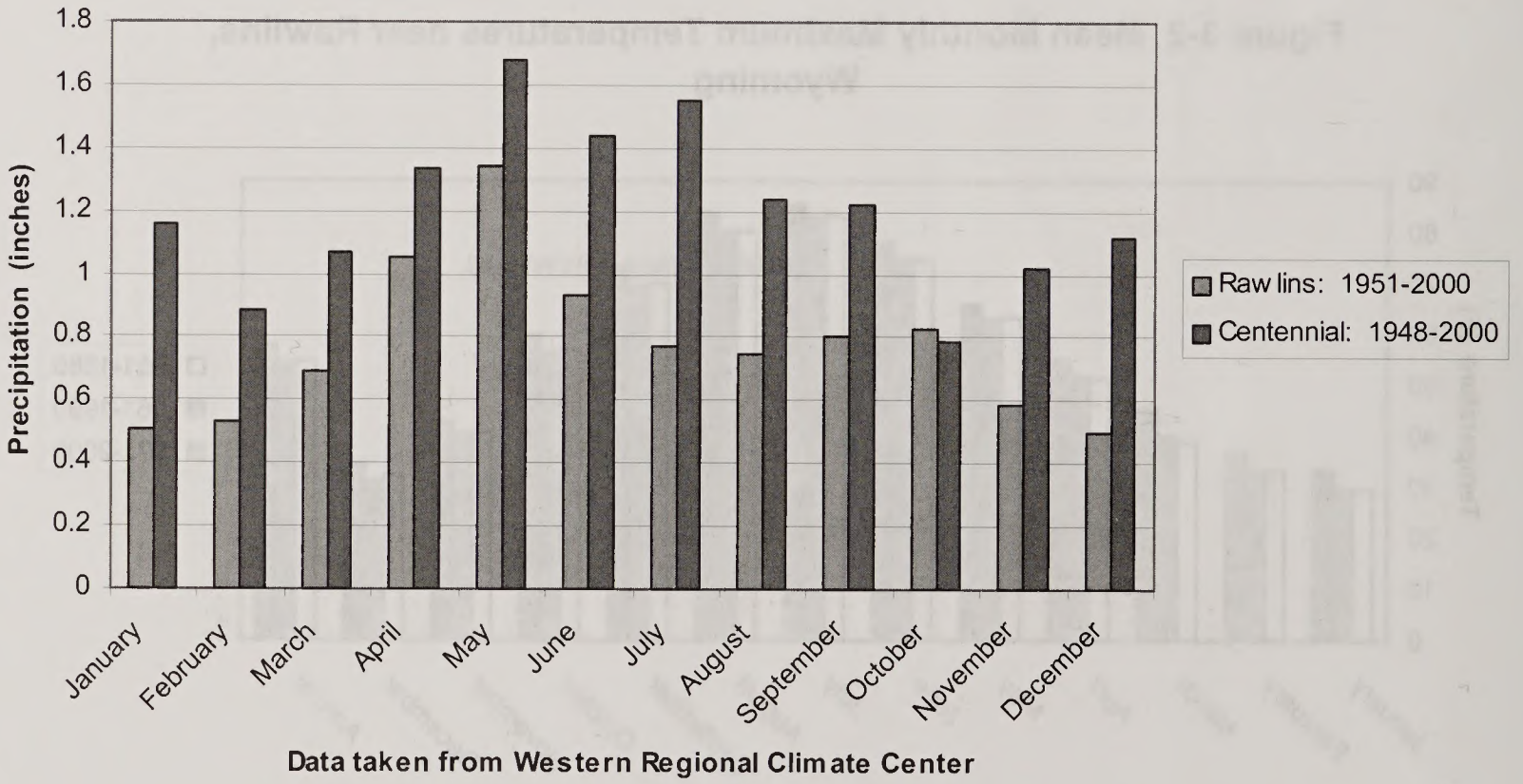


Figure 3-5 Mean Monthly Snowfall in the Rawlins RMPPA

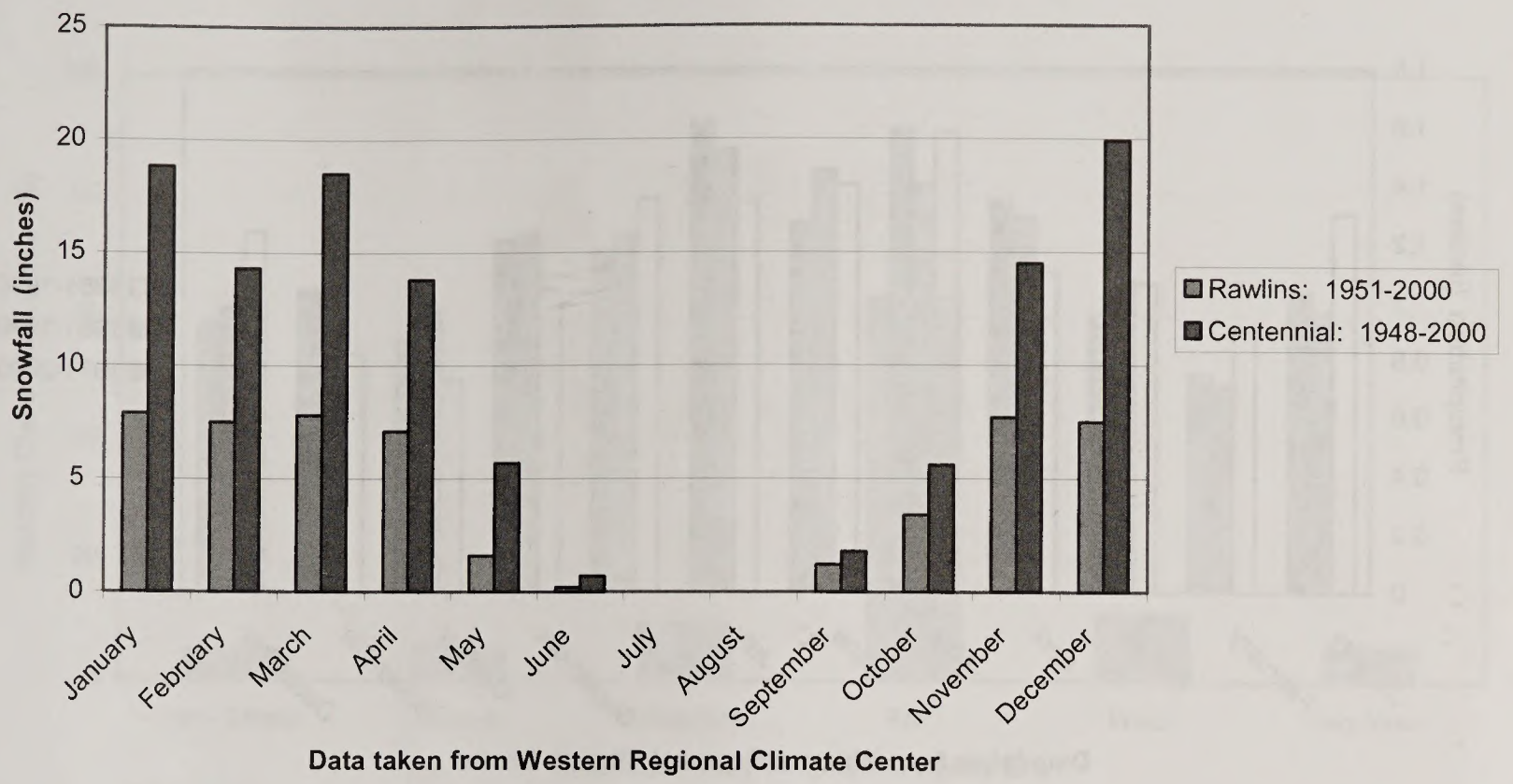


Figure 3-6 Mean Monthly Precipitation Trend near Rawlins, Wyoming

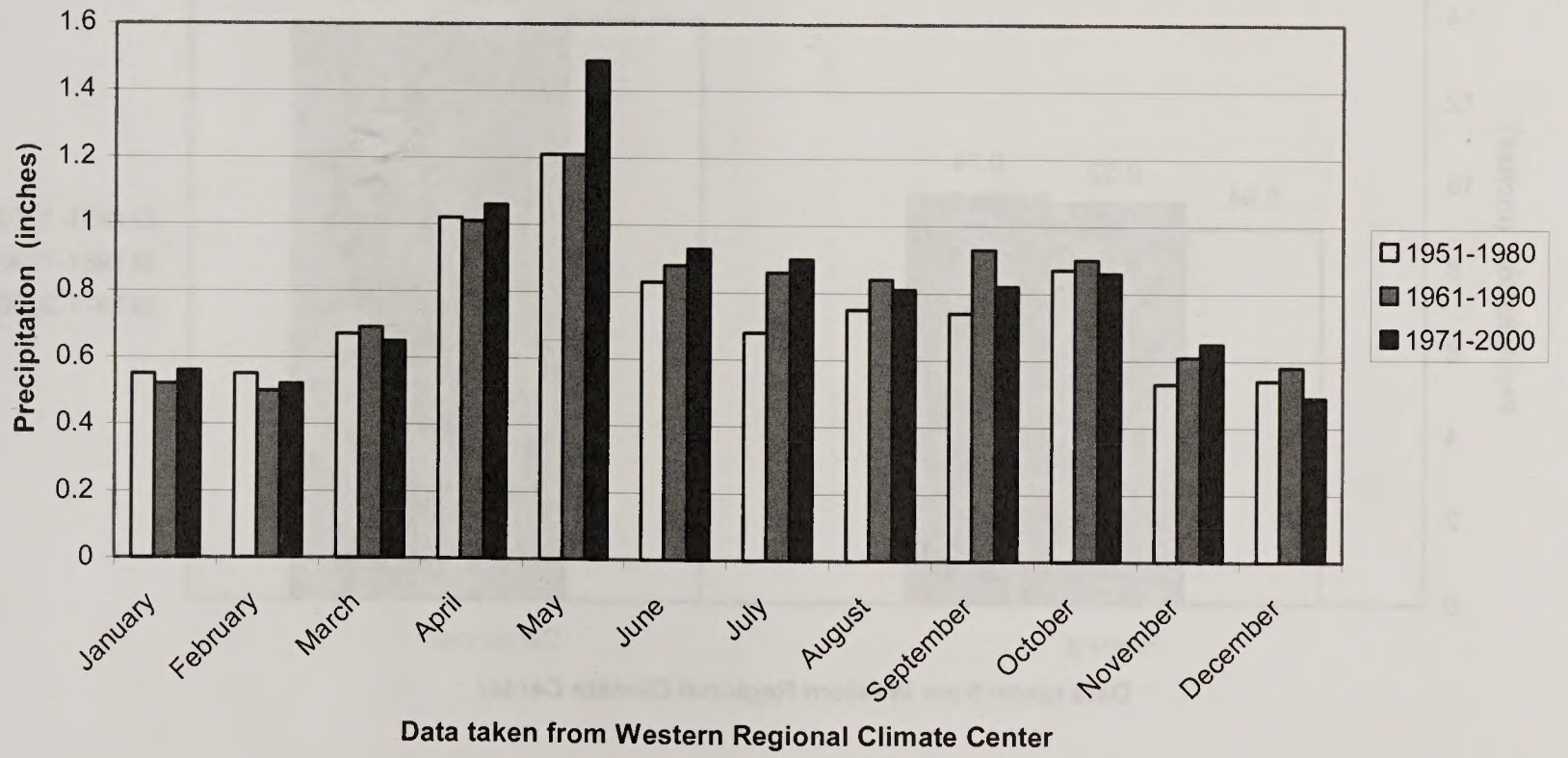


Figure 3-7 Mean Monthly Precipitation trend near Centennial, Wyoming

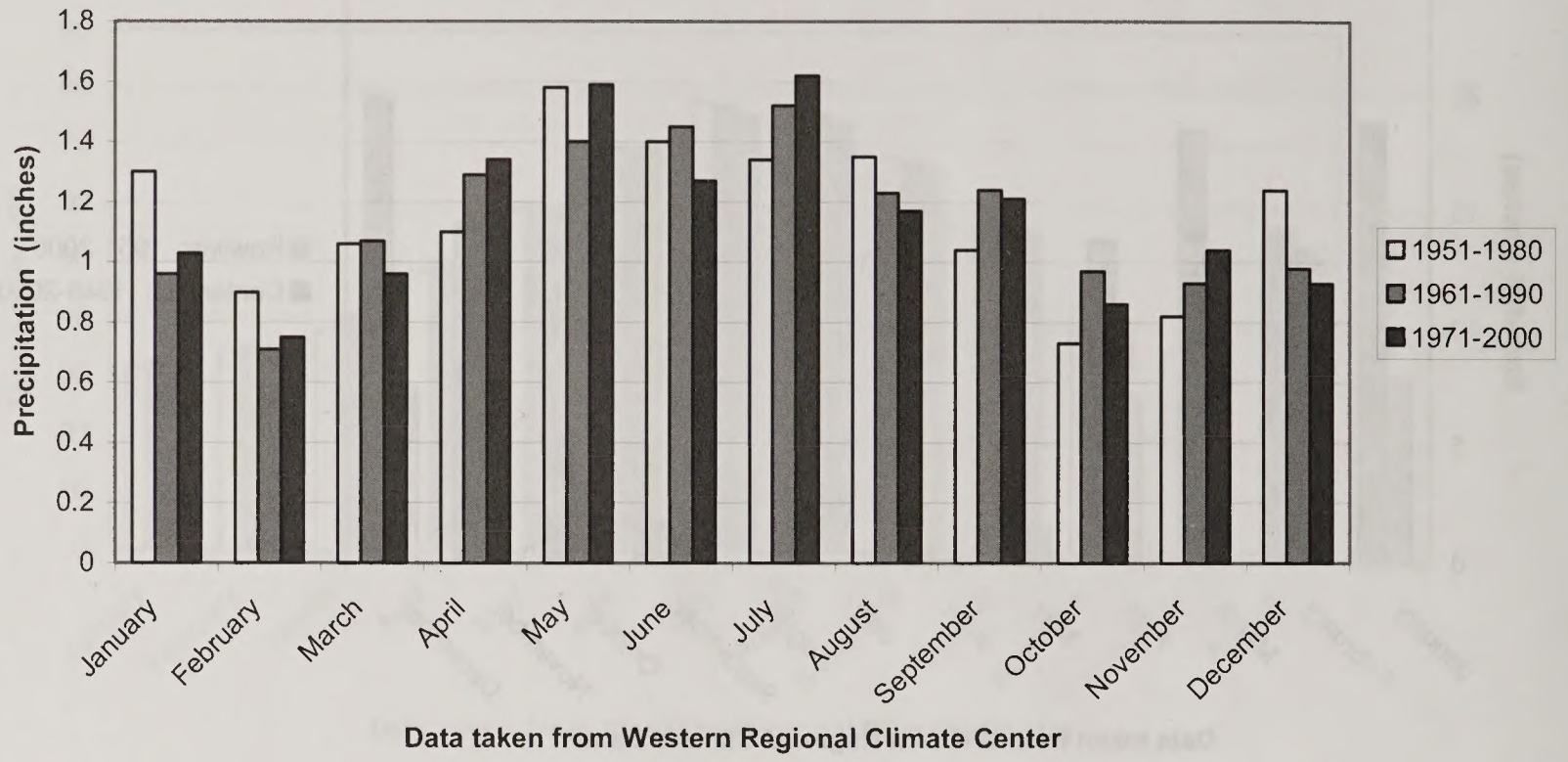


Figure 3-8 Mean Annual Precipitation Trend in the Rawlins RMPPA

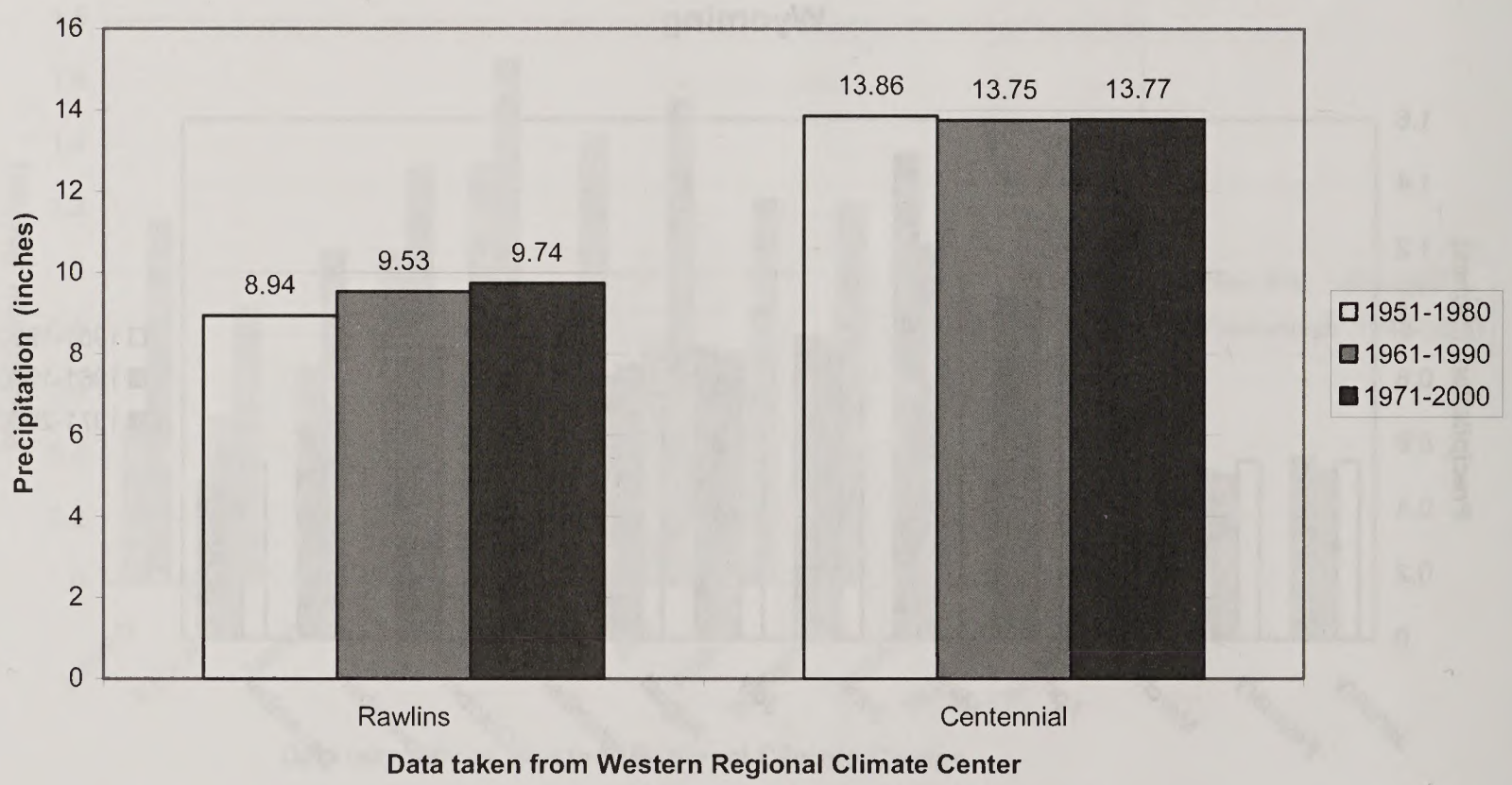


Figure 3-9 Capacity to Disperse Air Pollutants in Rock Springs, Wyoming

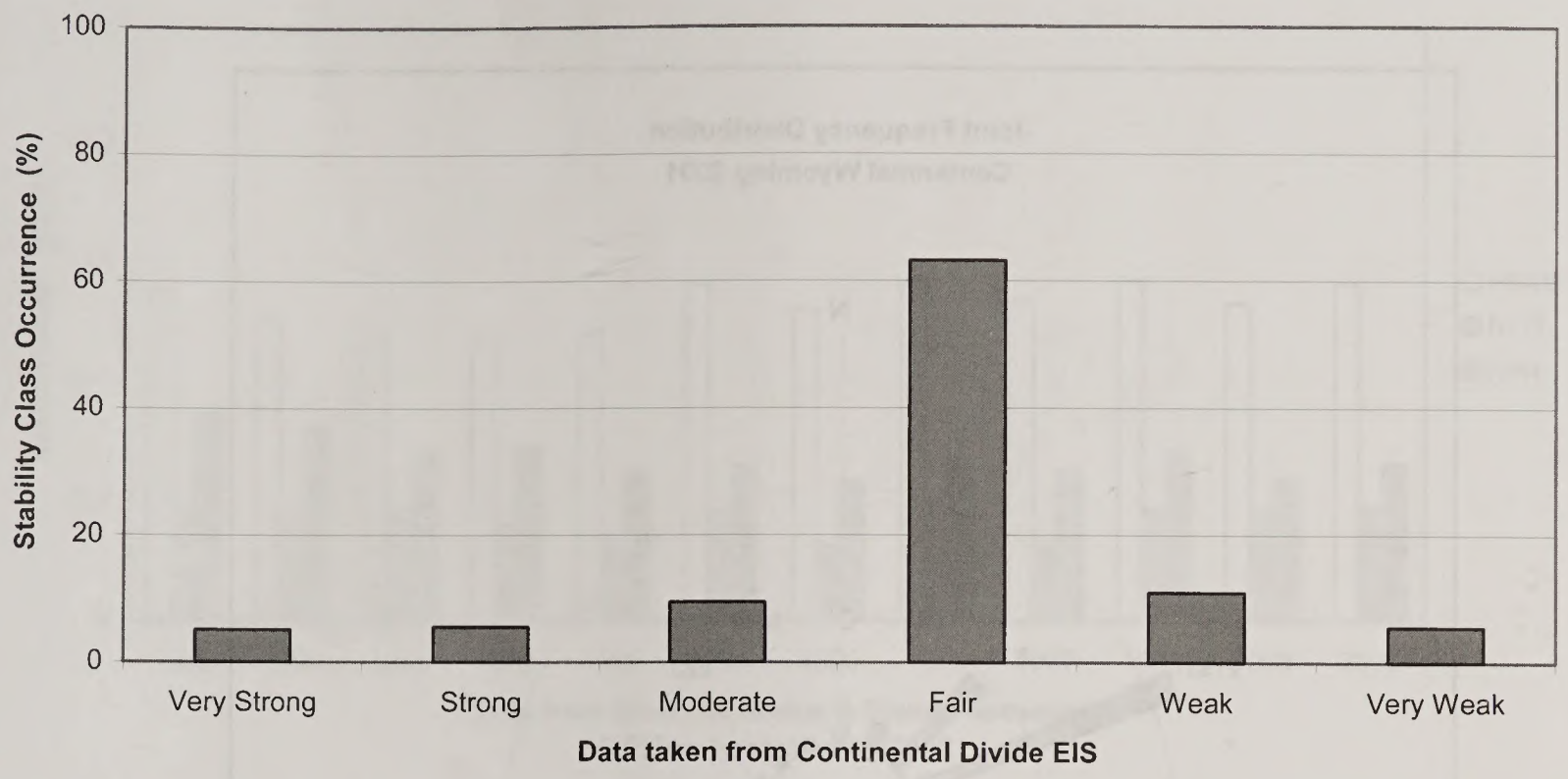


Figure 3-10: Wind Rose for Centennial, Wyoming

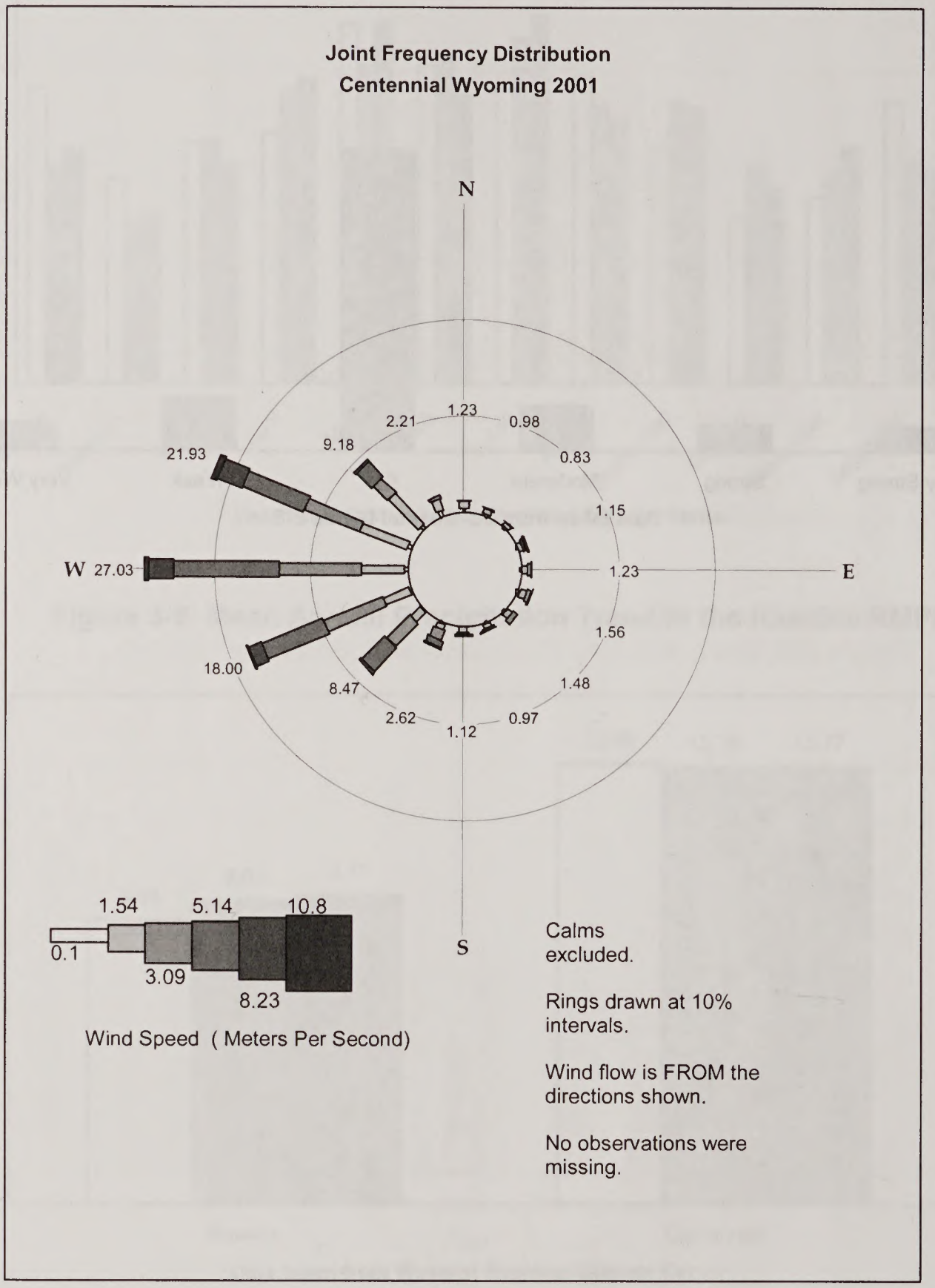


Figure 3-11 Mean Annual Concentrations of Nitrogen Compounds near Centennial, Wyoming

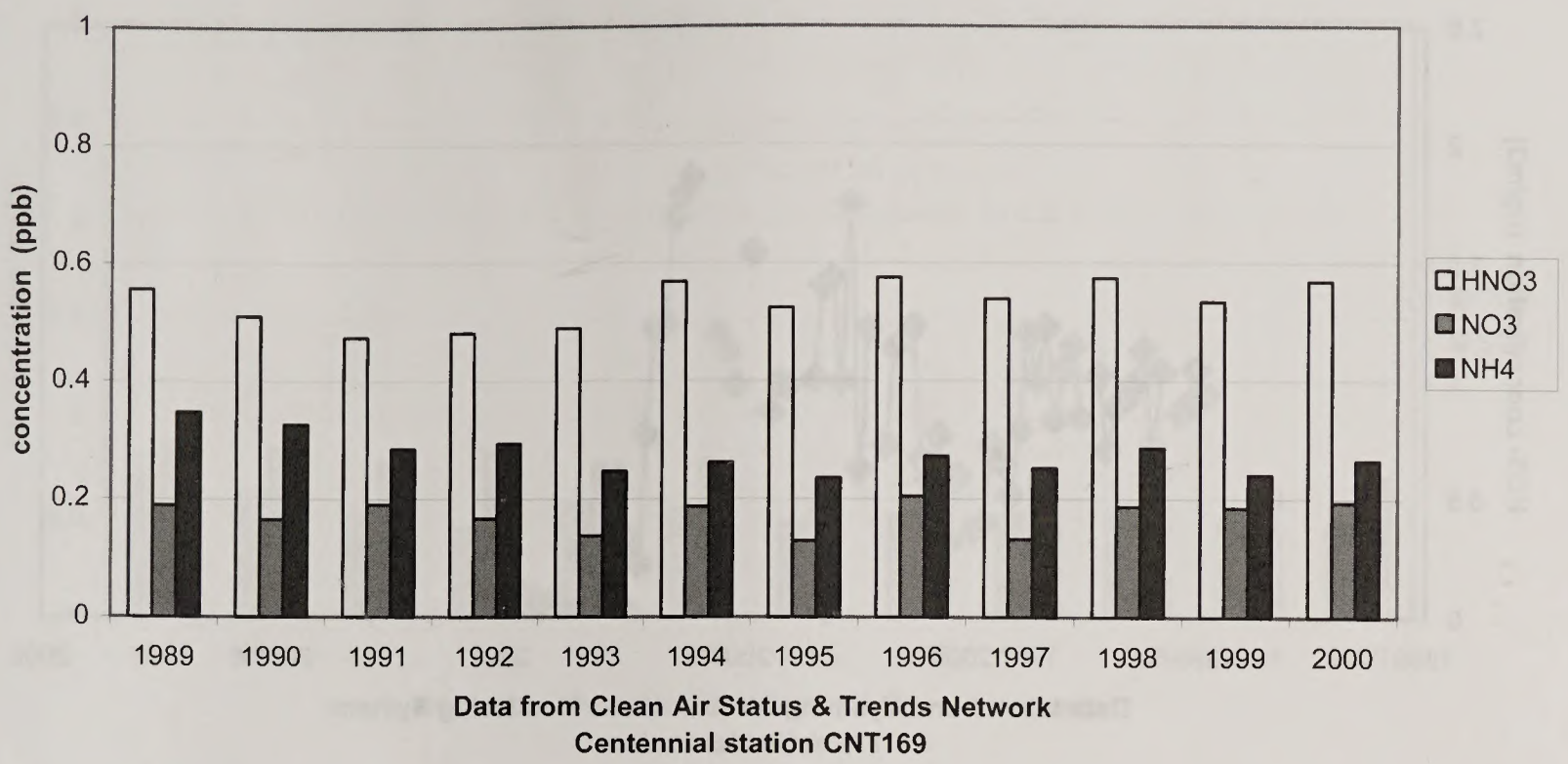


Figure 3-12 Mean Annual Concentrations of Nitrogen Compounds in Rocky Mountain National Park, Colorado

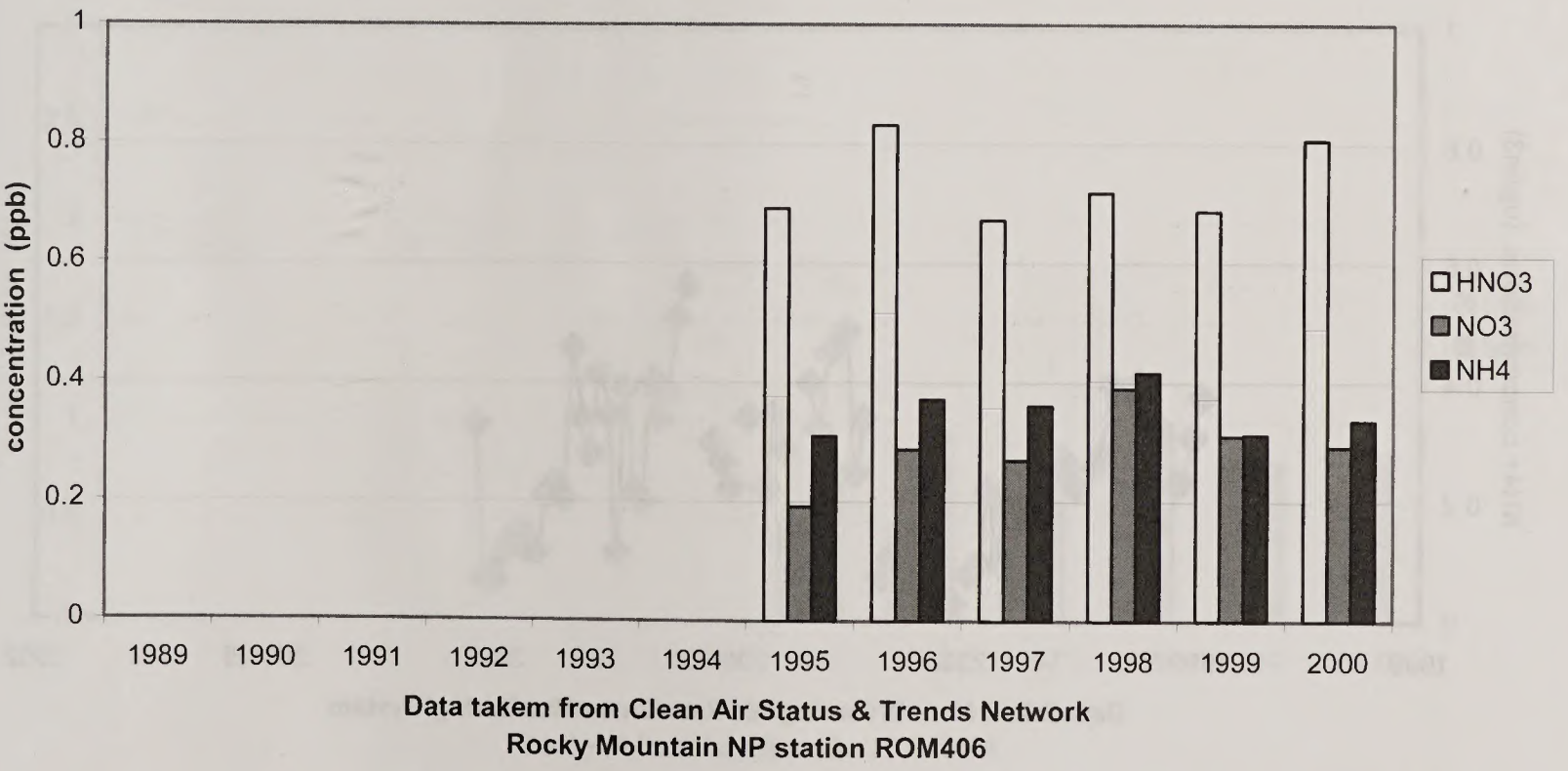


Figure 3-13 Weekly Total Nitrate Concentrations near Centennial, Wyoming

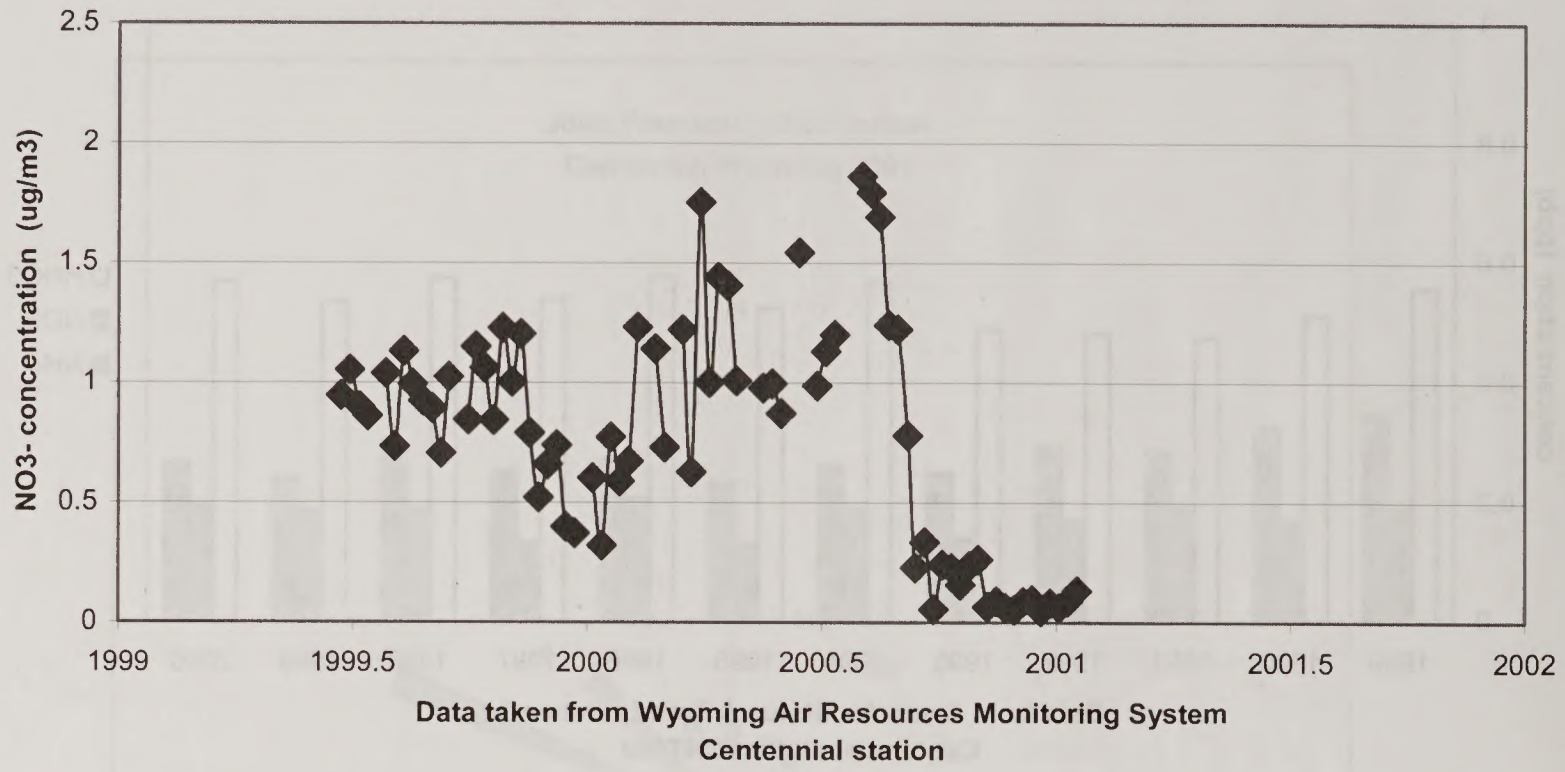


Figure 3-14 Weekly Ammonium Concentrations near Centennial, Wyoming

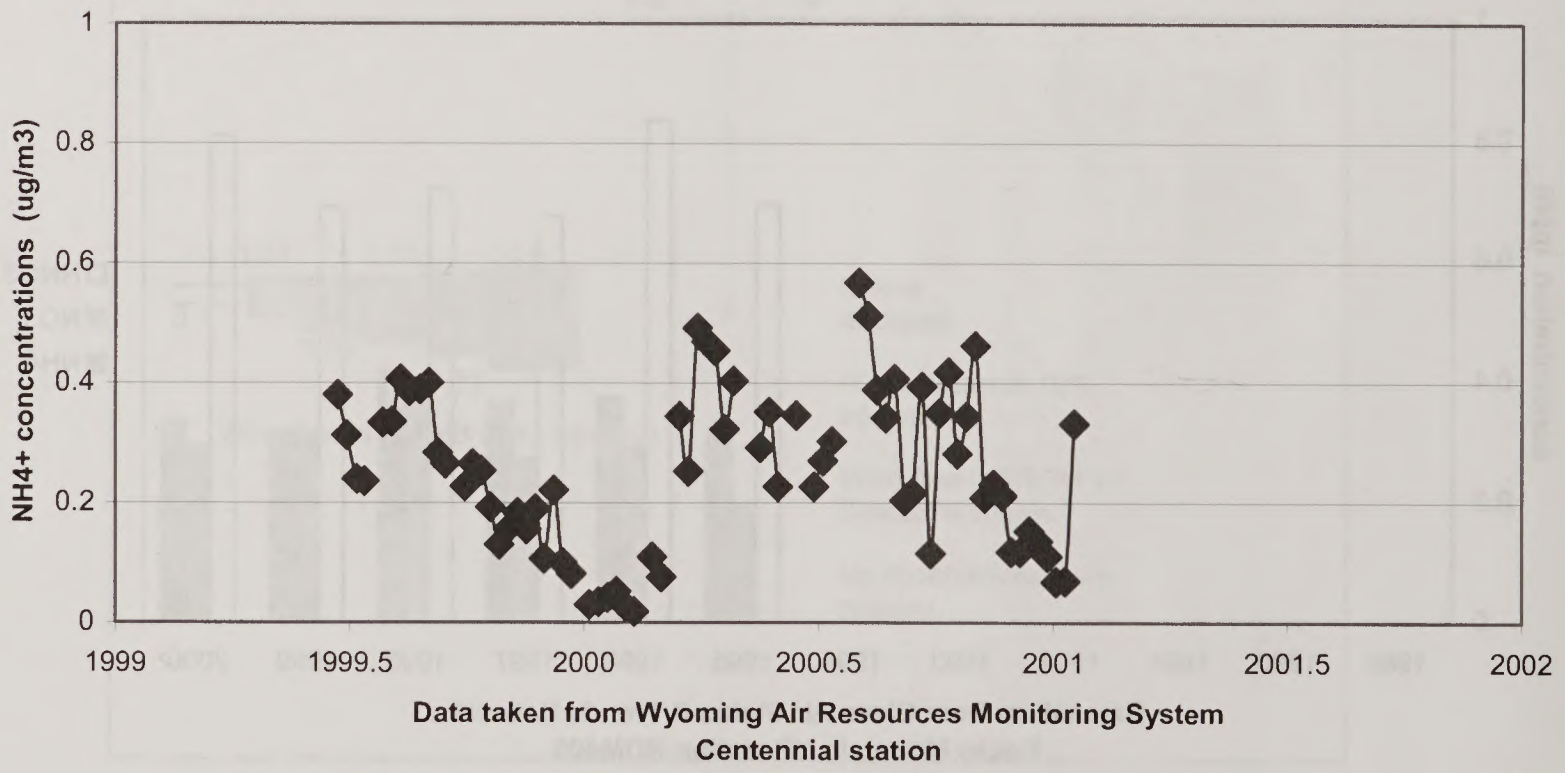


Figure 3-15 Mean Annual Concentrations of Sulfur Compounds near Centennial, Wyoming

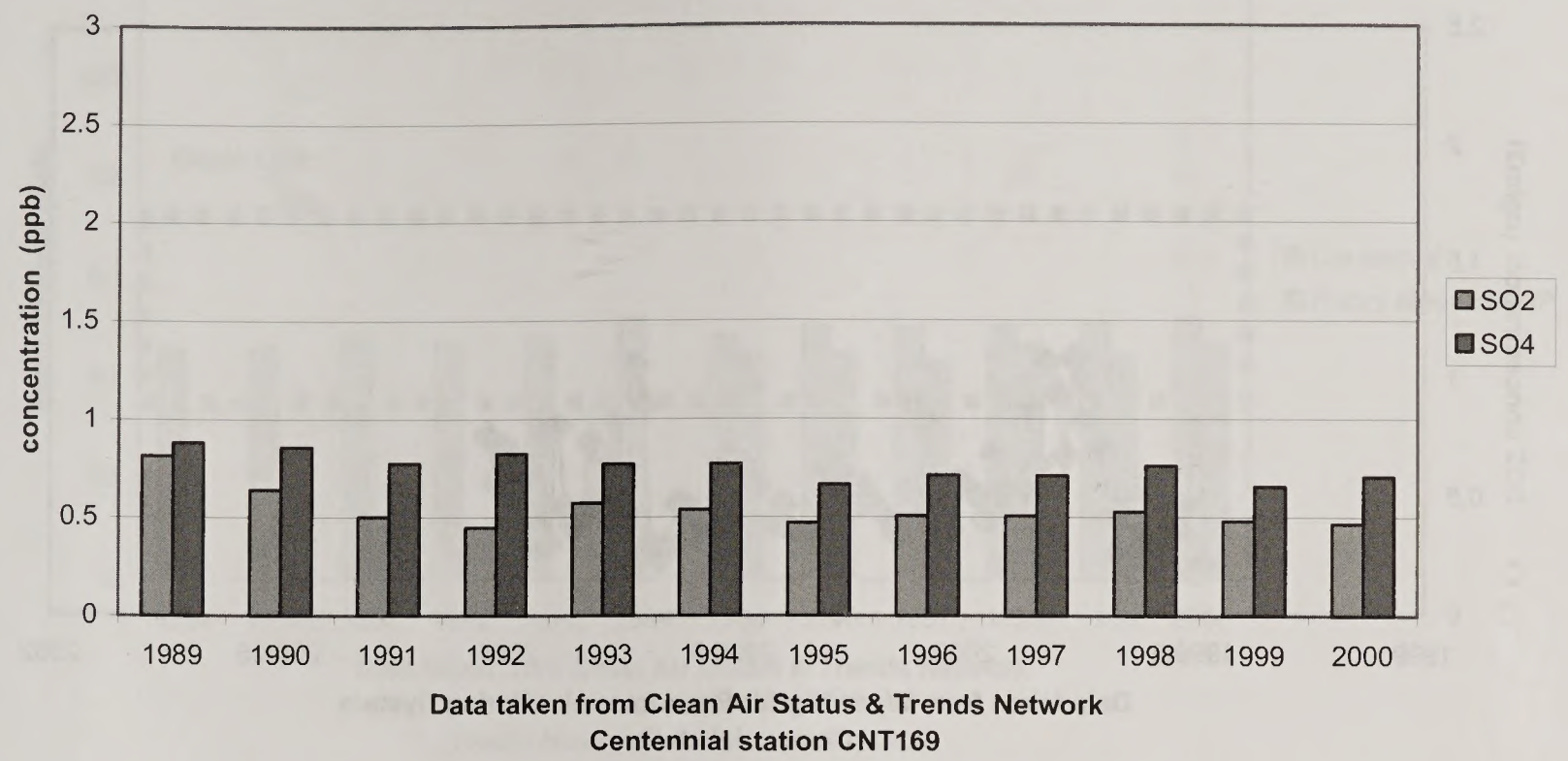


Figure 3-16 Mean Annual Concentrations of Sulfur Compounds in Rocky Mountain National Park, Colorado

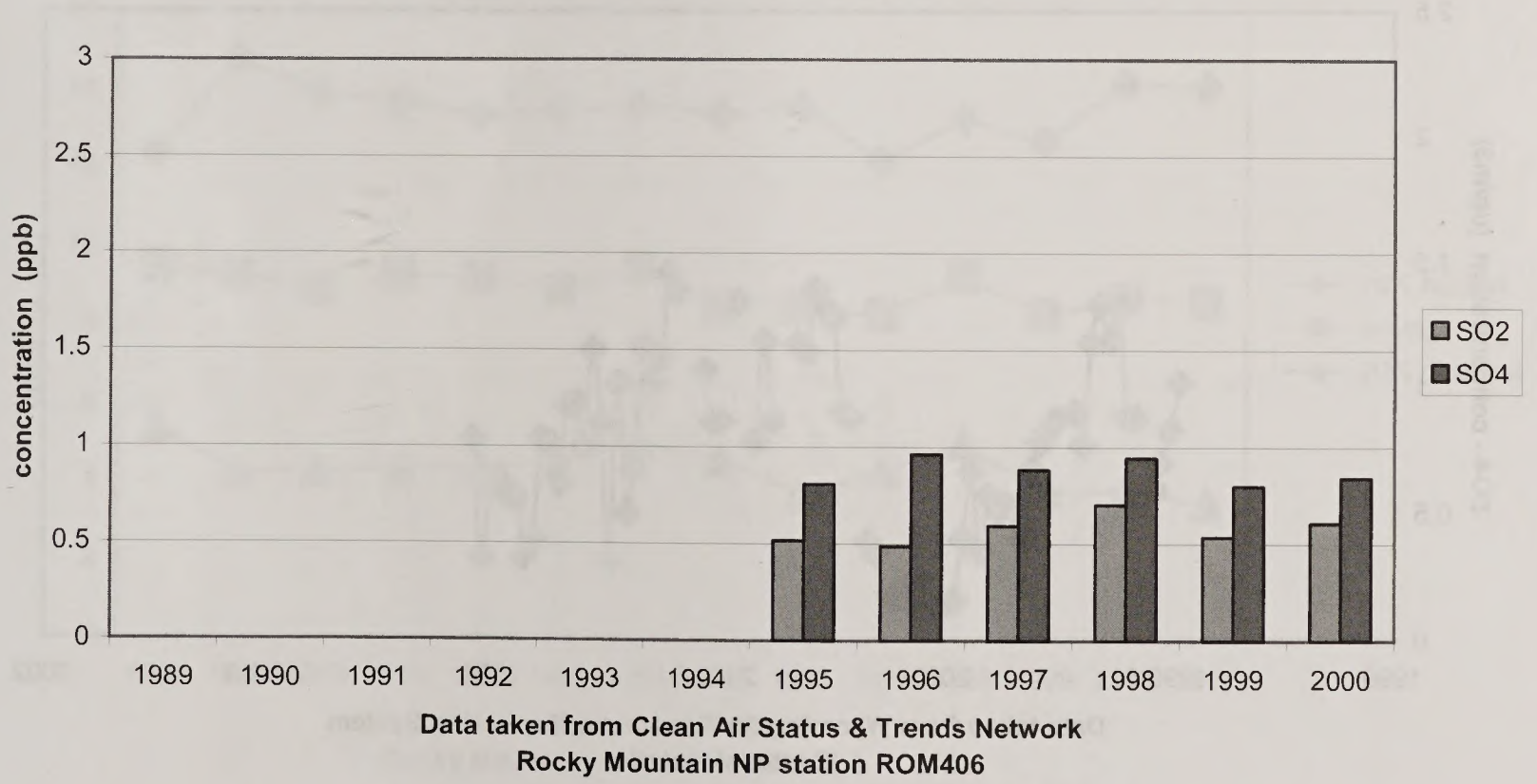


Figure 3-17 Weekly Sulfur Dioxide Concentrations near Centennial, Wyoming

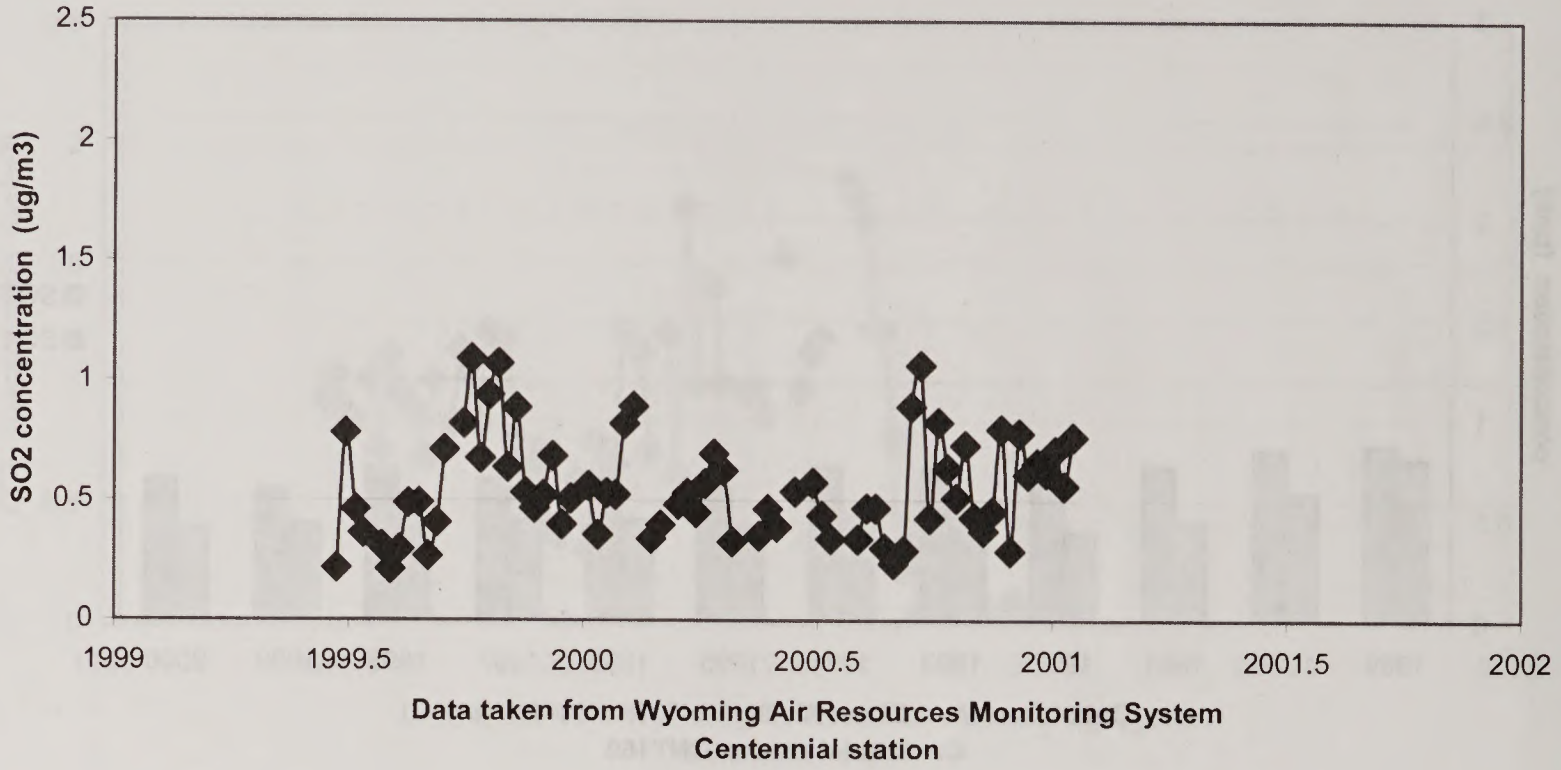


Figure 3-18 Weekly Sulfate Concentrations near Centennial, Wyoming

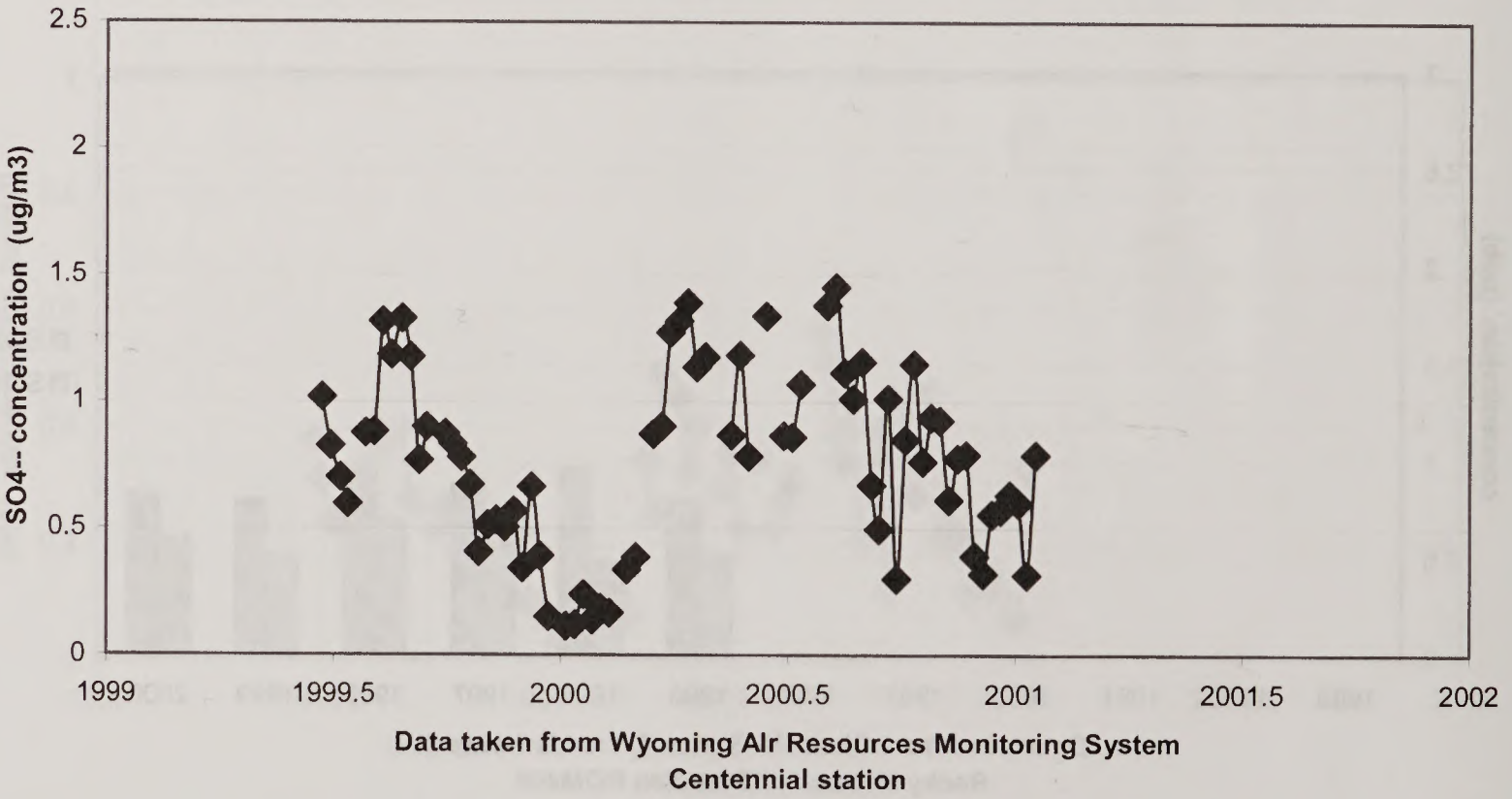


Figure 3-19 Mean Annual Ozone Concentrations in the Rawlins RMPPA

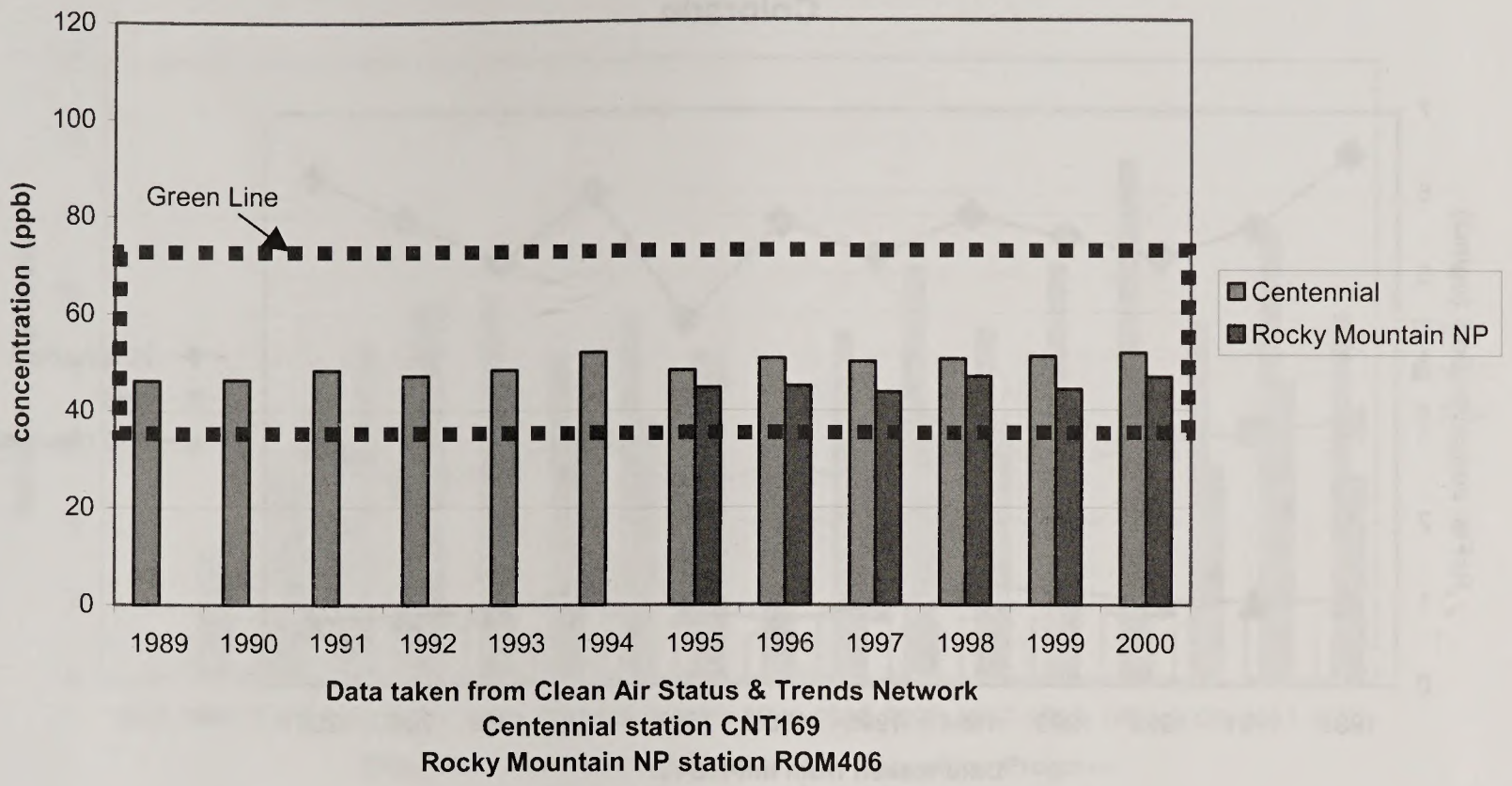


Figure 3-20 Visibility in Rocky Mountain National Park, Colorado

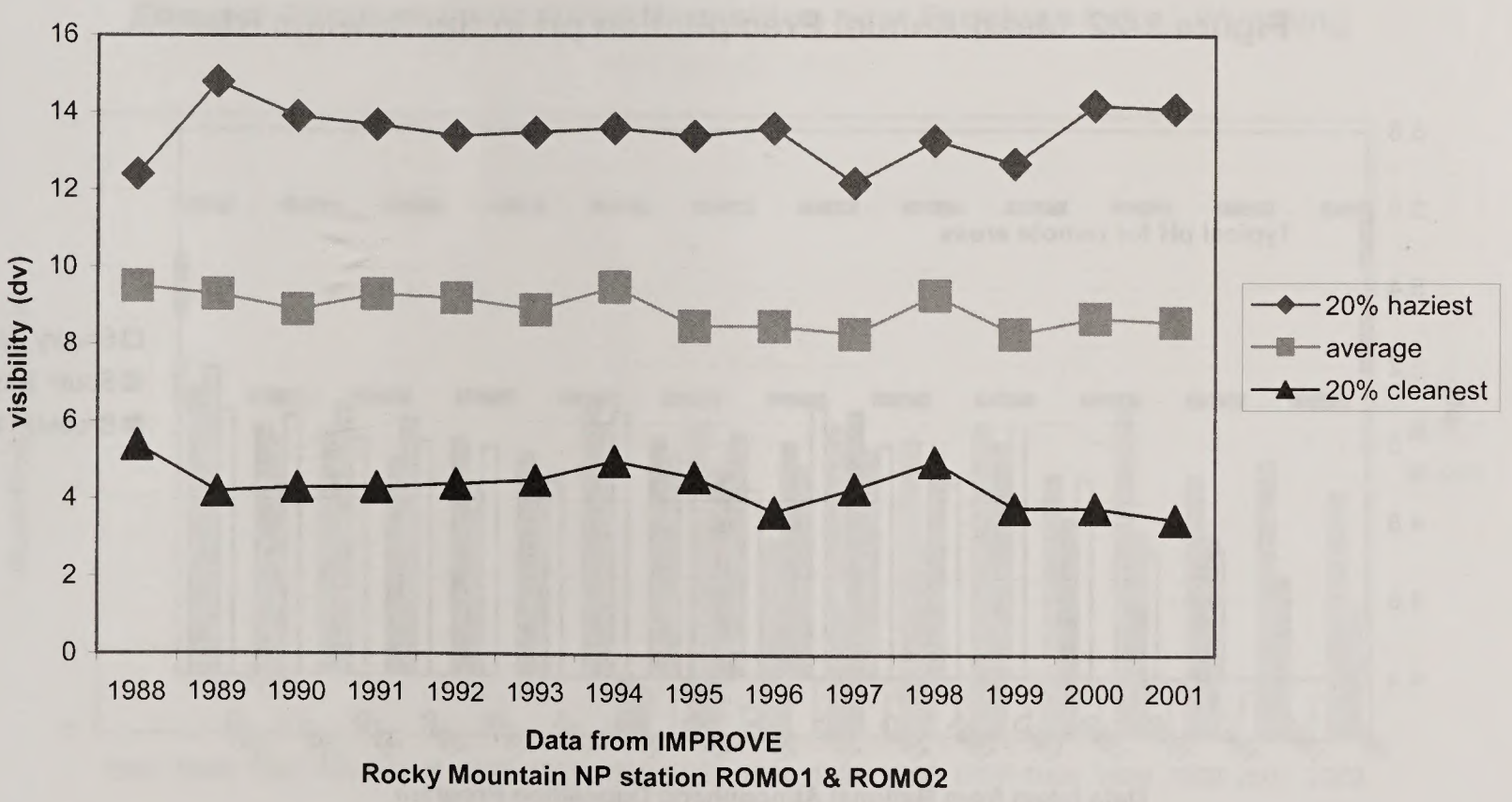


Figure 3-21 Annual Visibility (RcFM) in Rocky Mountain National Park, Colorado

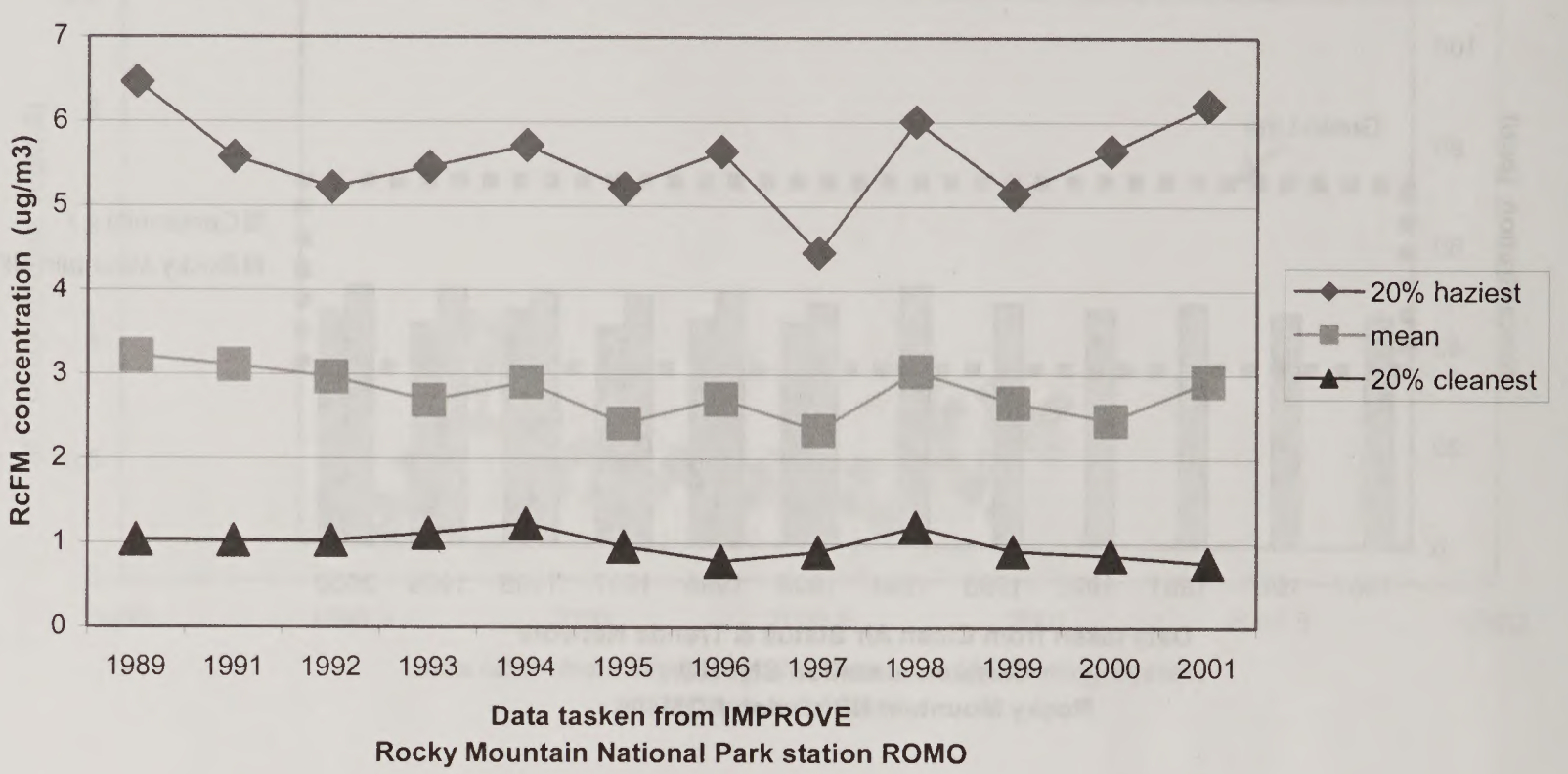


Figure 3-22 Mean Annual Precipitation pH in the Rawlins RMPPA

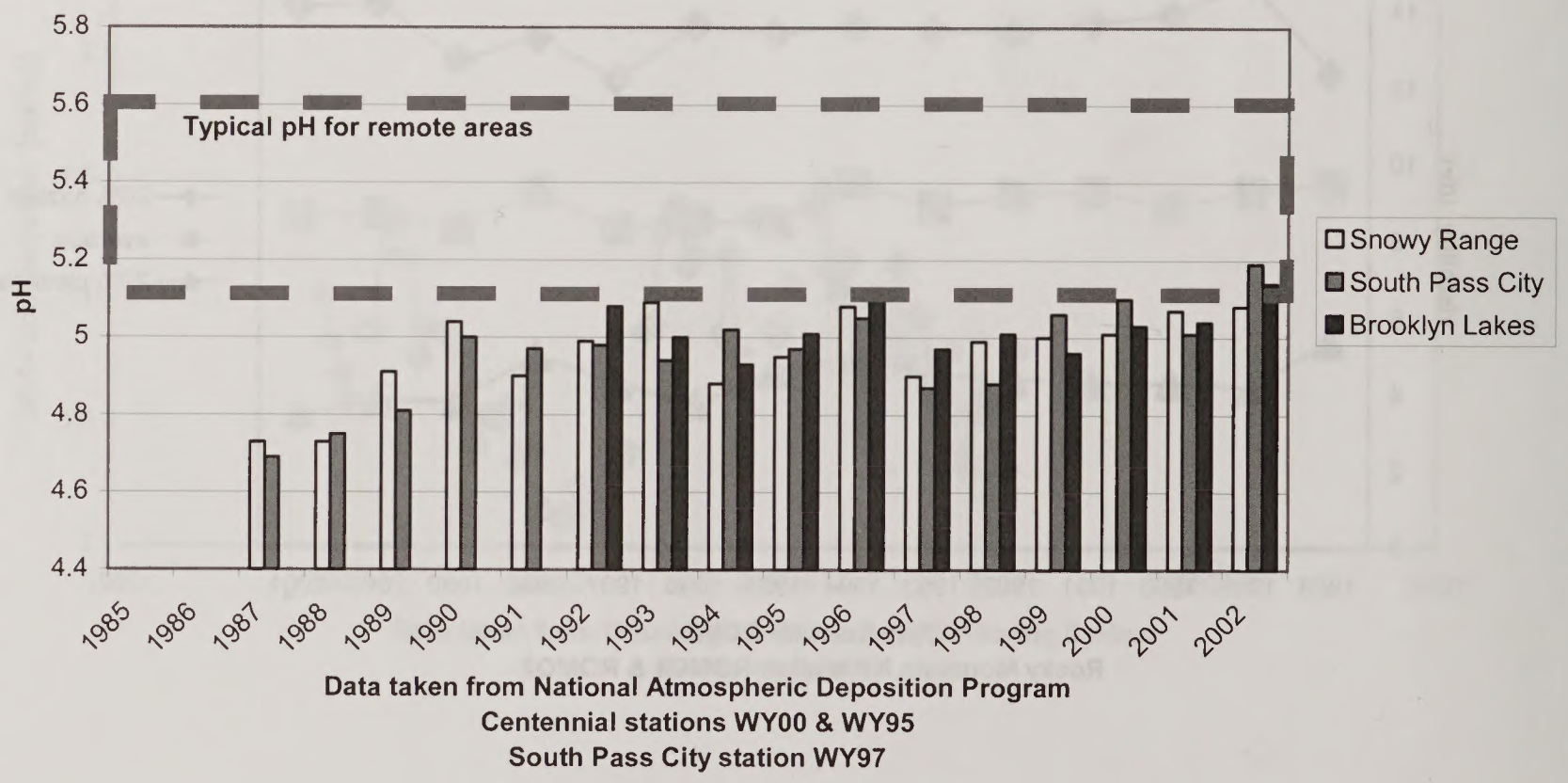


Figure 3-23 Mean Annual Wet Deposition near Centennial, Wyoming

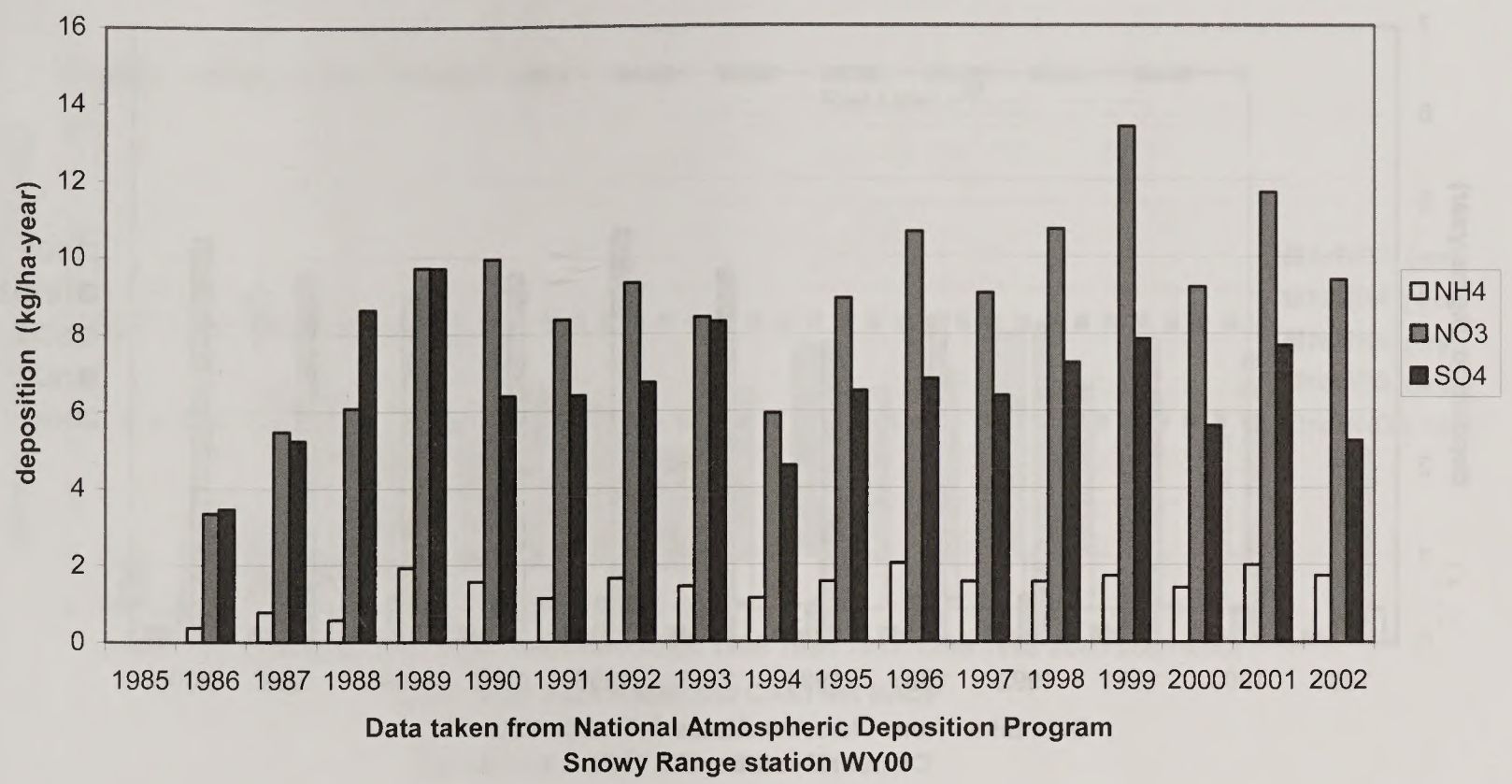


Figure 3-24 Mean Annual Wet Deposition near Brooklyn Lake, Wyoming

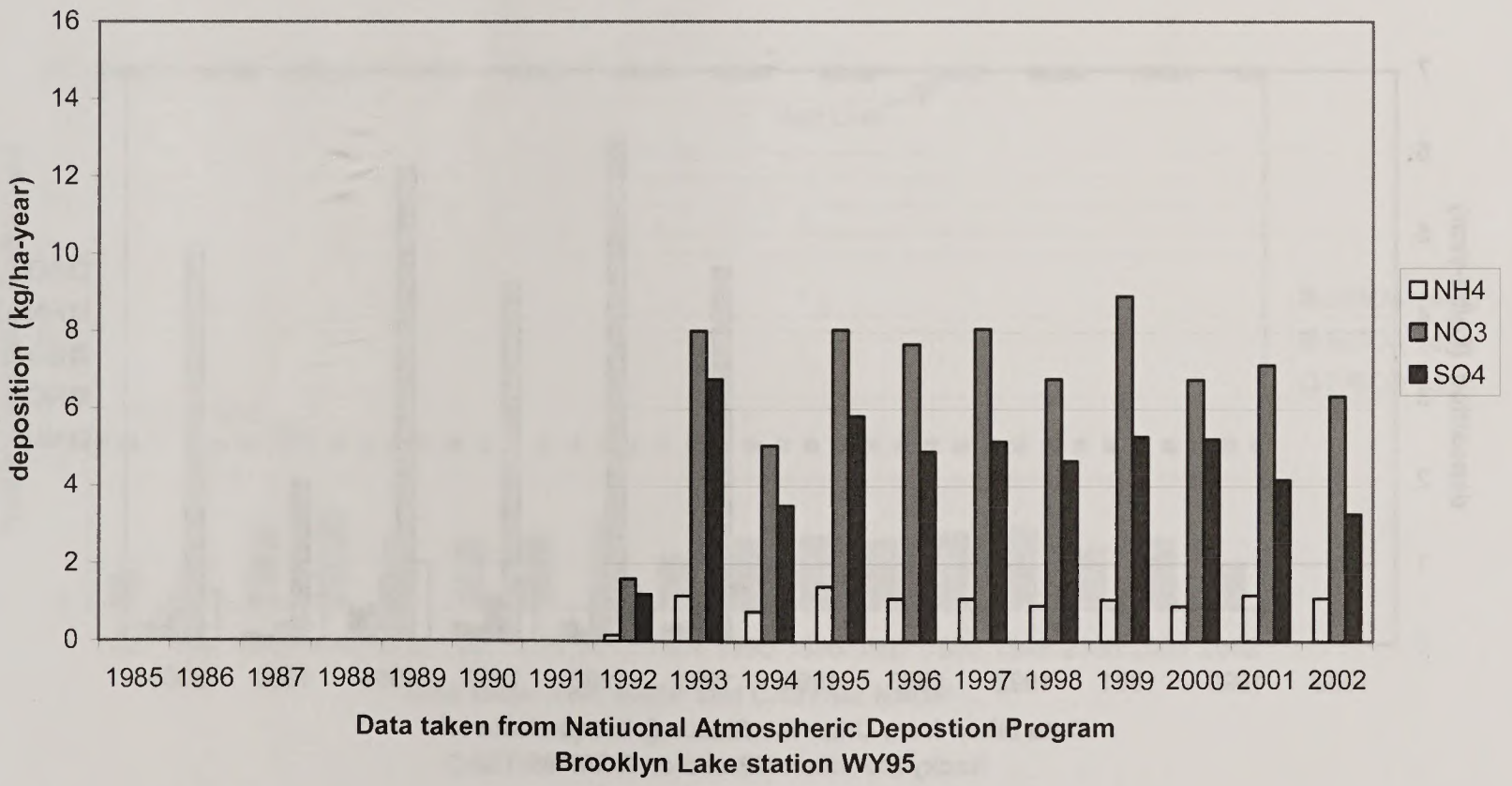


Figure 3-25 Mean Annual Dry Deposition near Centennial, Wyoming

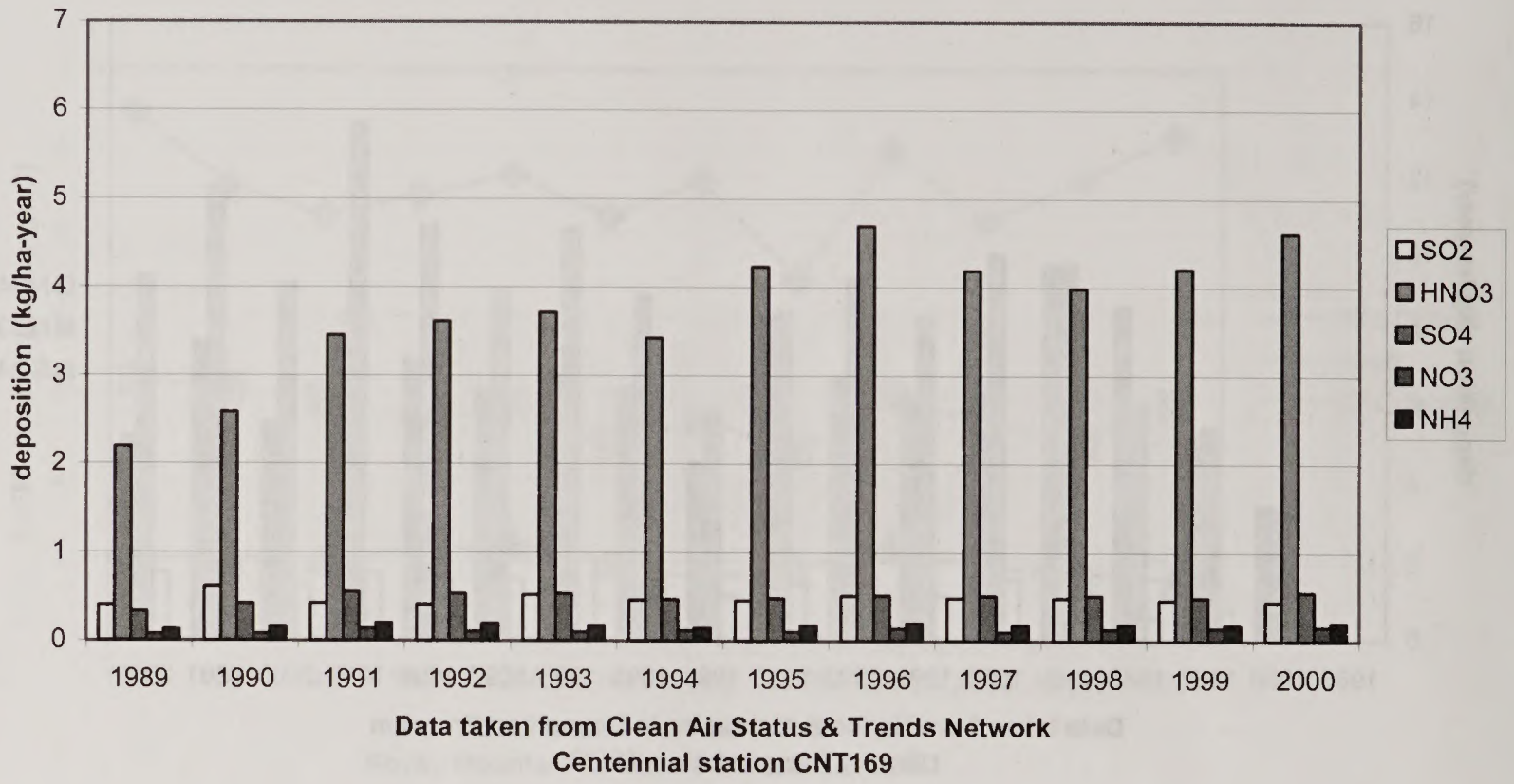


Figure 3-26 Mean Annual Dry Deposition in Rocky Mountain National Park, Colorado

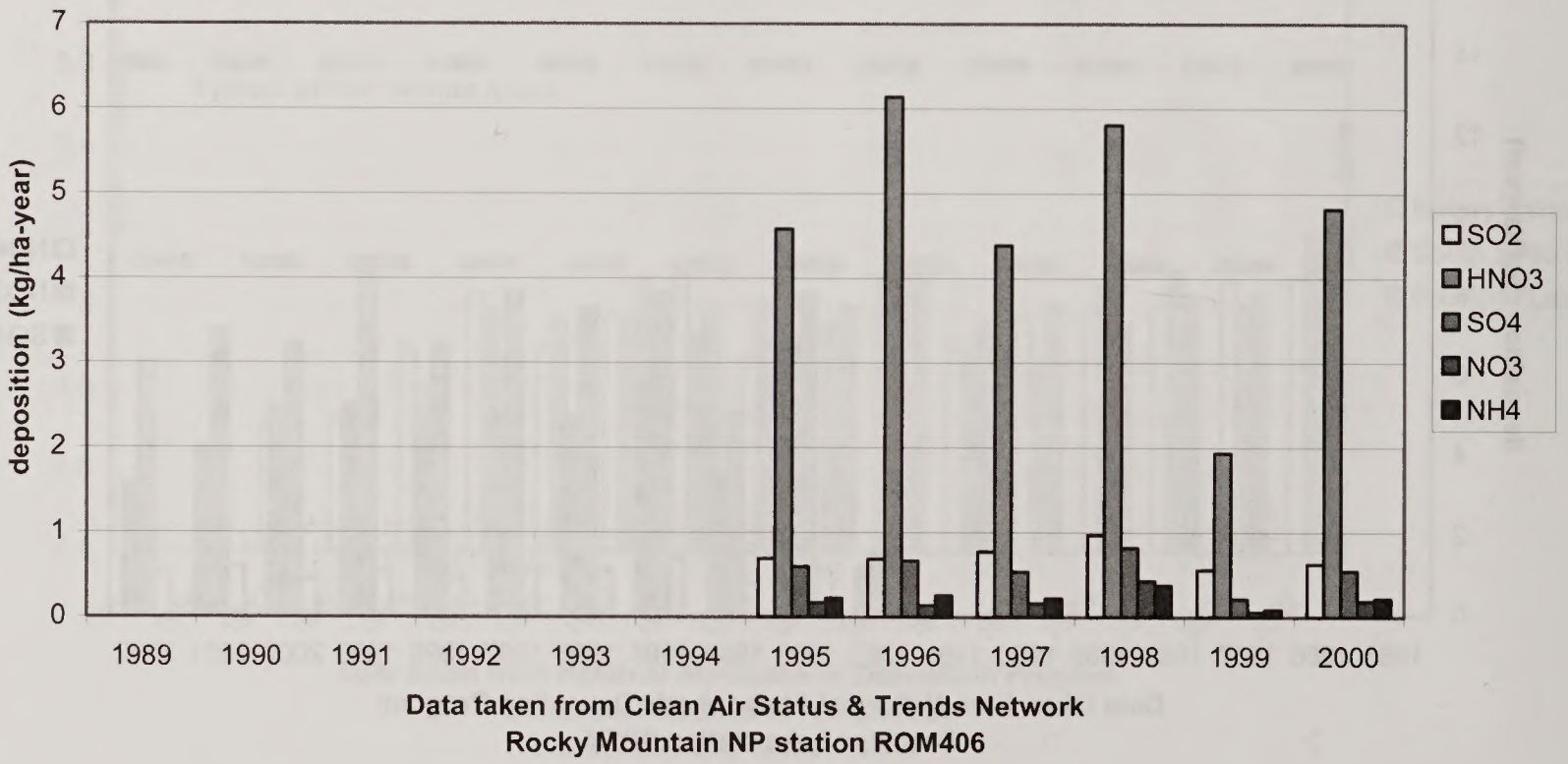
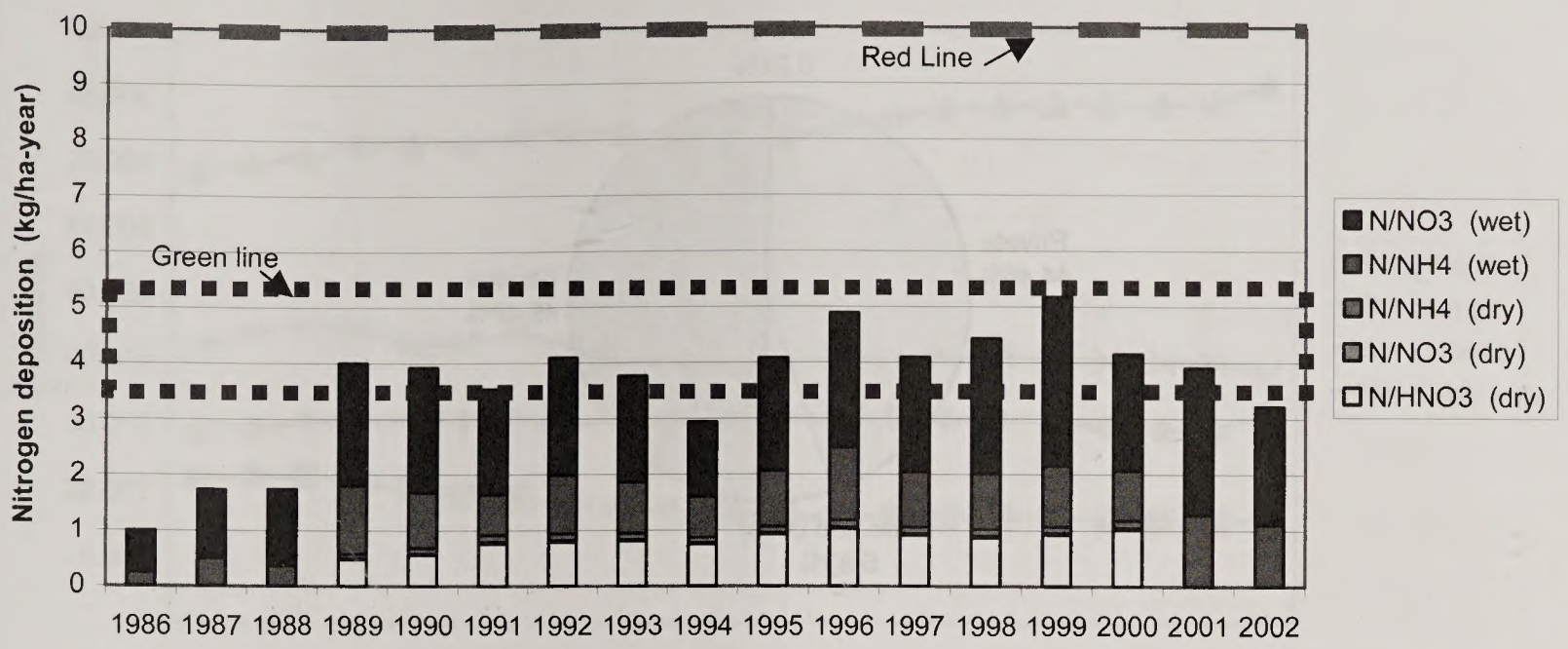
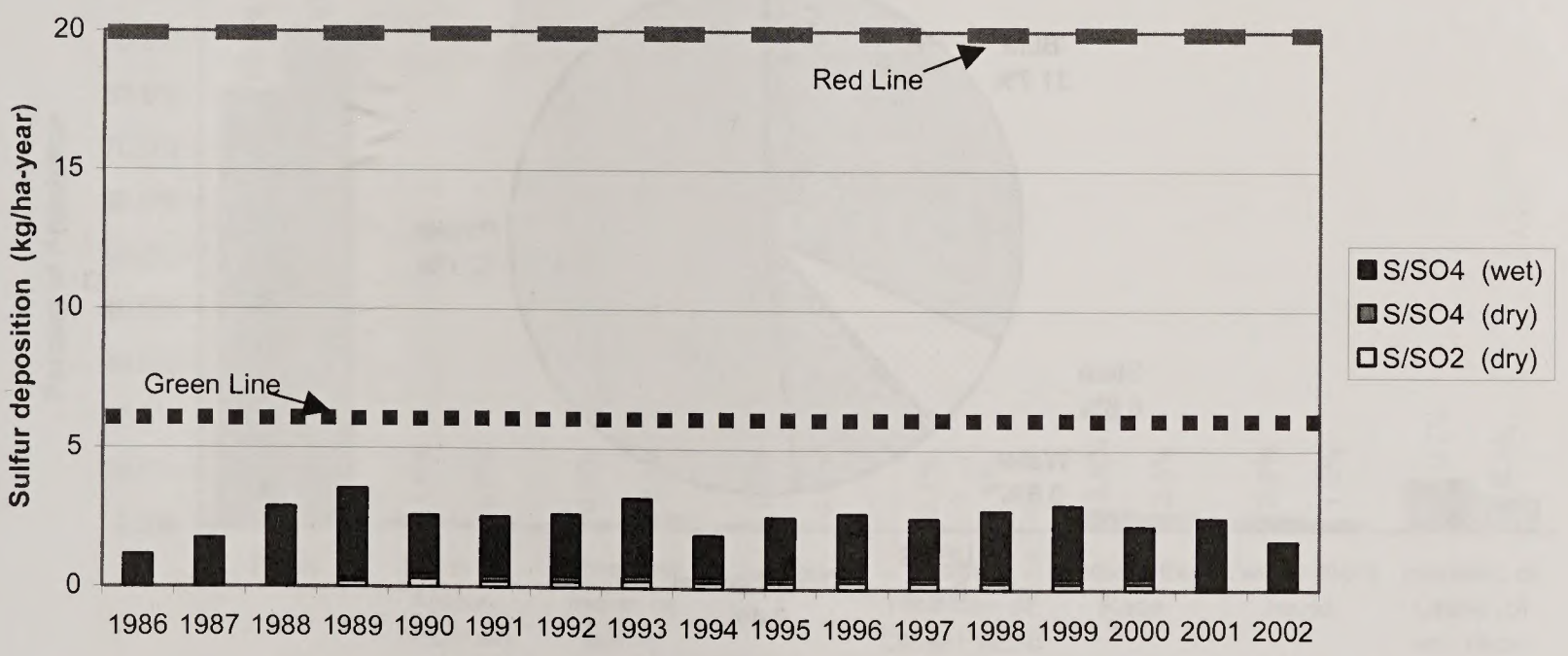


Figure 3-27 Mean Annual Total Nitrogen Deposition near Centennial, Wyoming



Data taken from NADP and CASTNet NADP
Snowy Range station WY00
CASTNet Centennial station CNT169

Figure 3-28 Mean Annual Total Sulfur Deposition near Centennial, Wyoming



Data taken from NADP and CASTNet NADP
Snowy Range station WY00
CASTNet Centennial station CNT169

Figure 3-29 Land Ownership in the Four County Socioeconomic Study Area

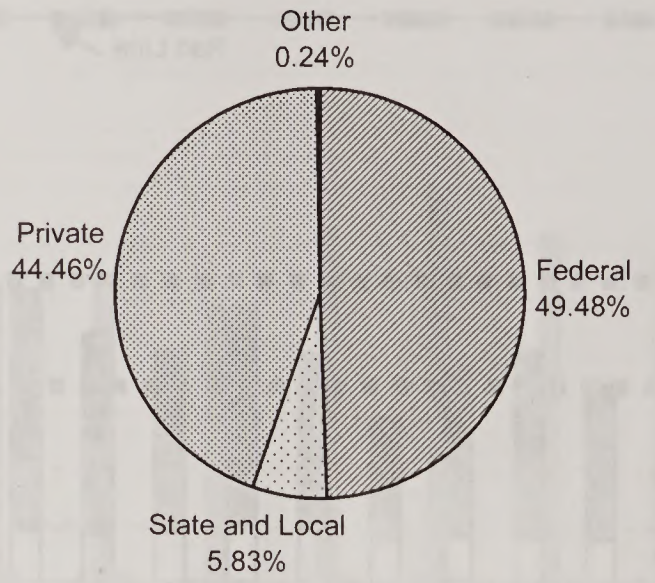


Figure 3-30 Land Ownership - Rawlins RMPPA

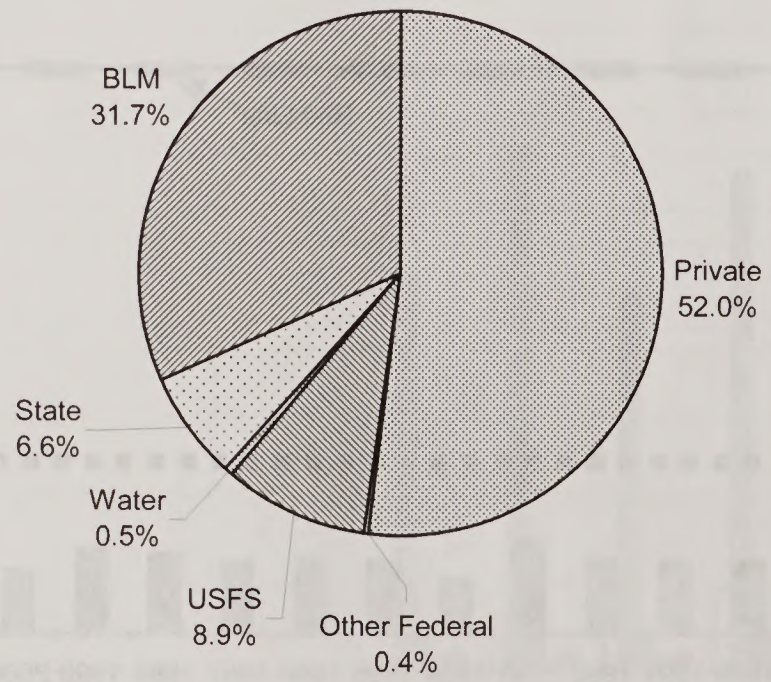


Figure 3-31 Population Estimate for Counties in the Socioeconomic Study Area

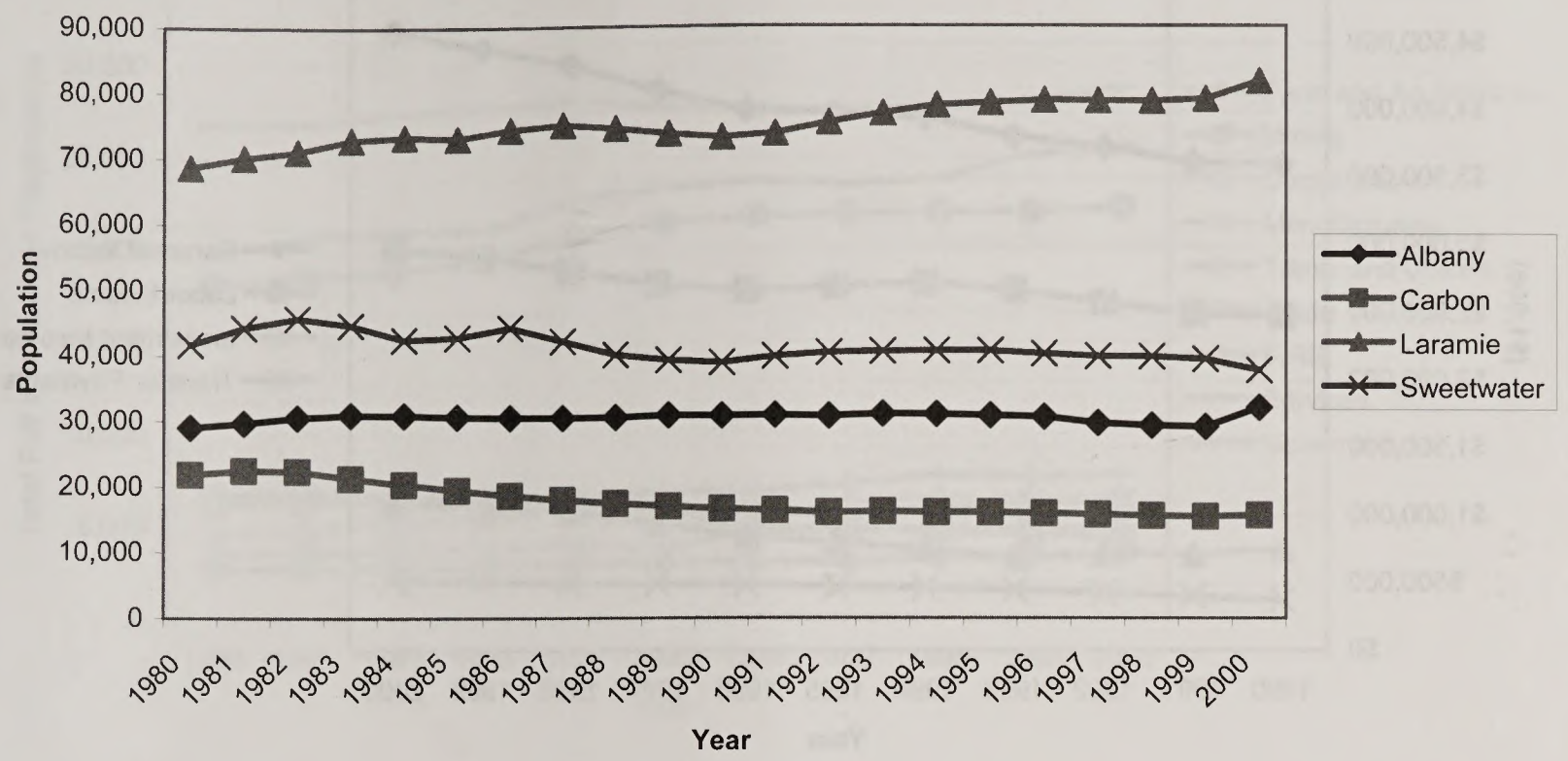


Figure 3-32 Population by Ethnicity for 2000

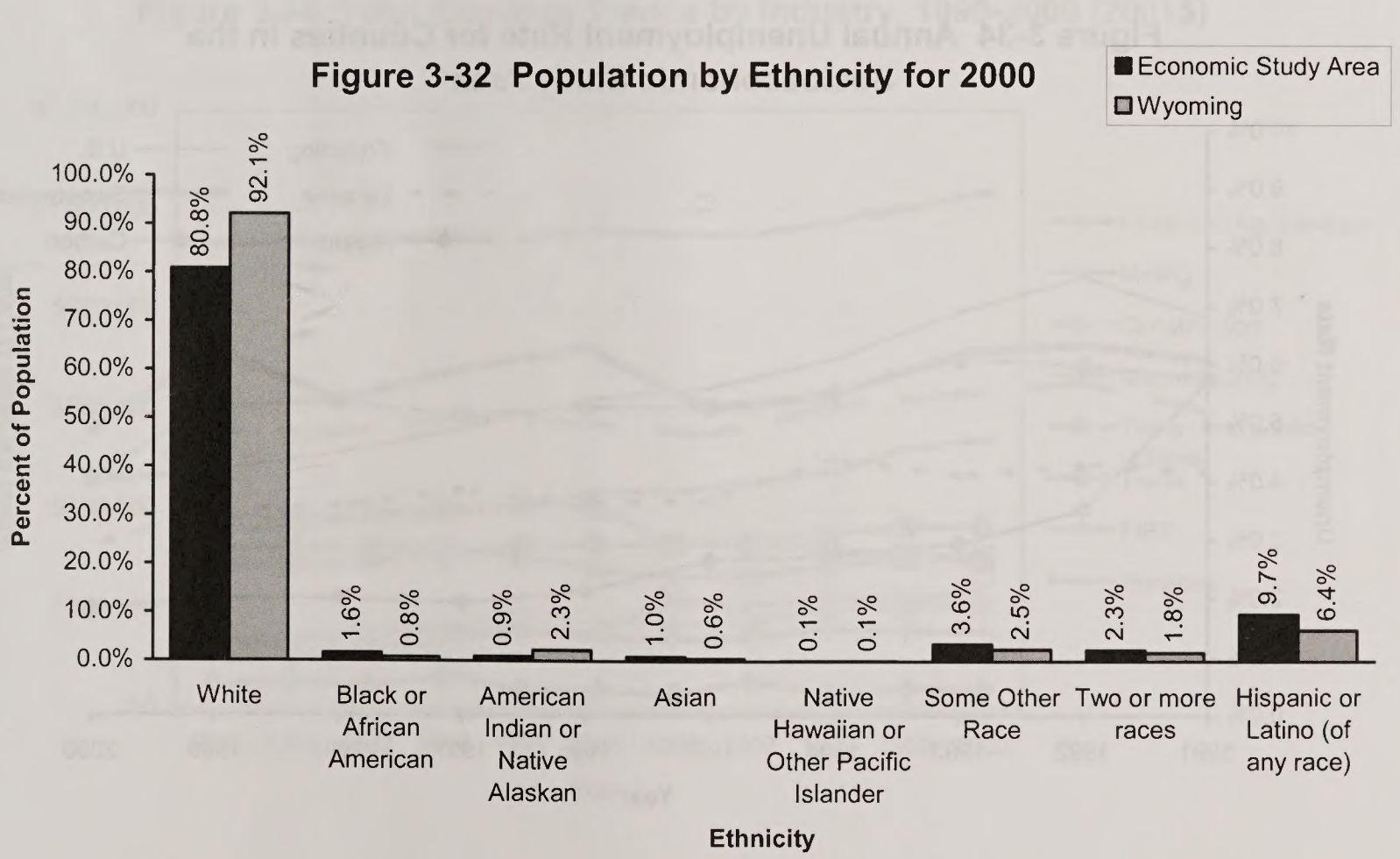


Figure 3-33 Personal Income Trends 1990-2000 (2001$)

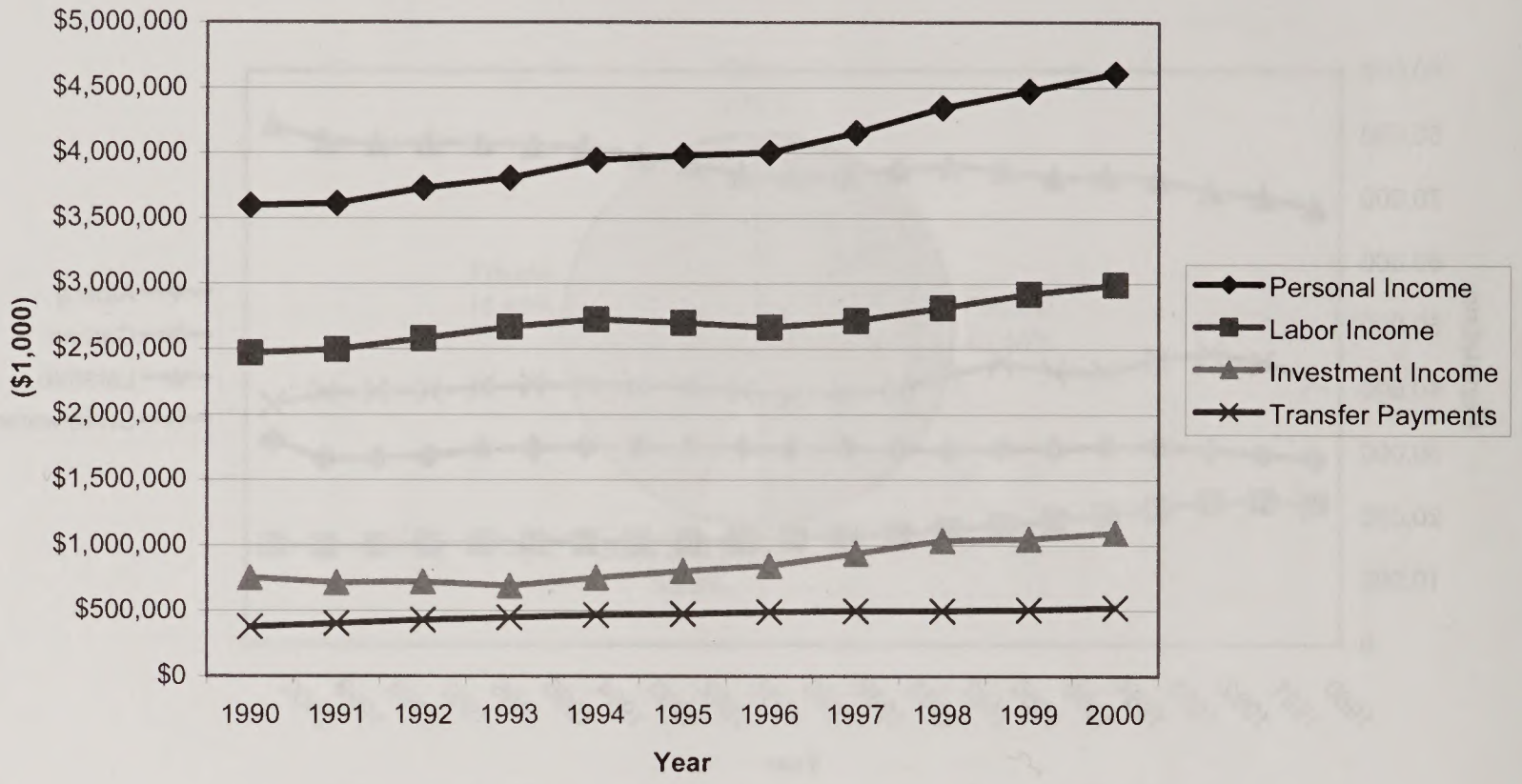


Figure 3-34 Annual Unemployment Rate for Counties in the Socioeconomic Study Area

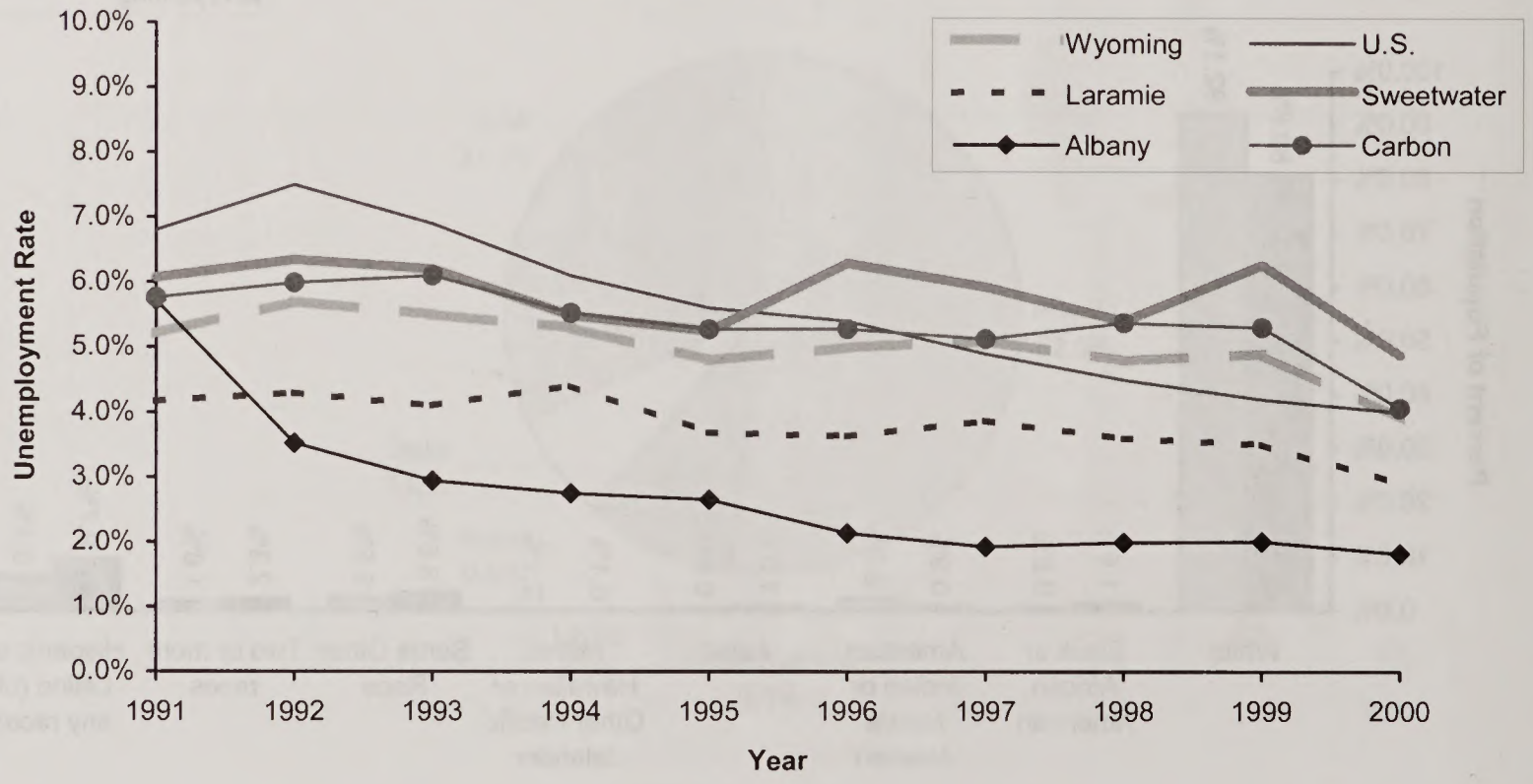


Figure 3-35 Employment Trends by Industry, 1990-2000

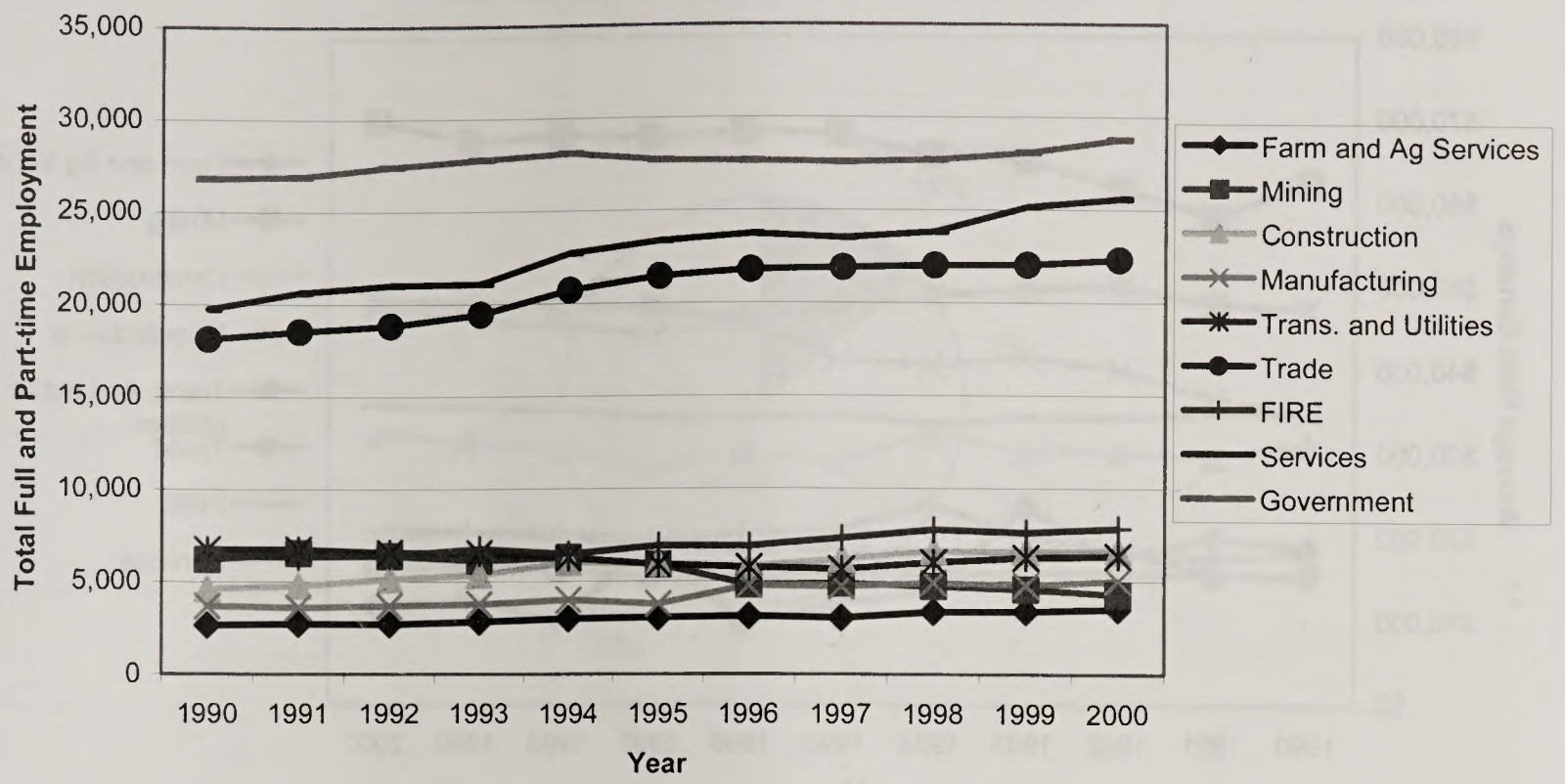


Figure 3-36 Total Earnings Trends by Industry, 1990-2000 (2001$)

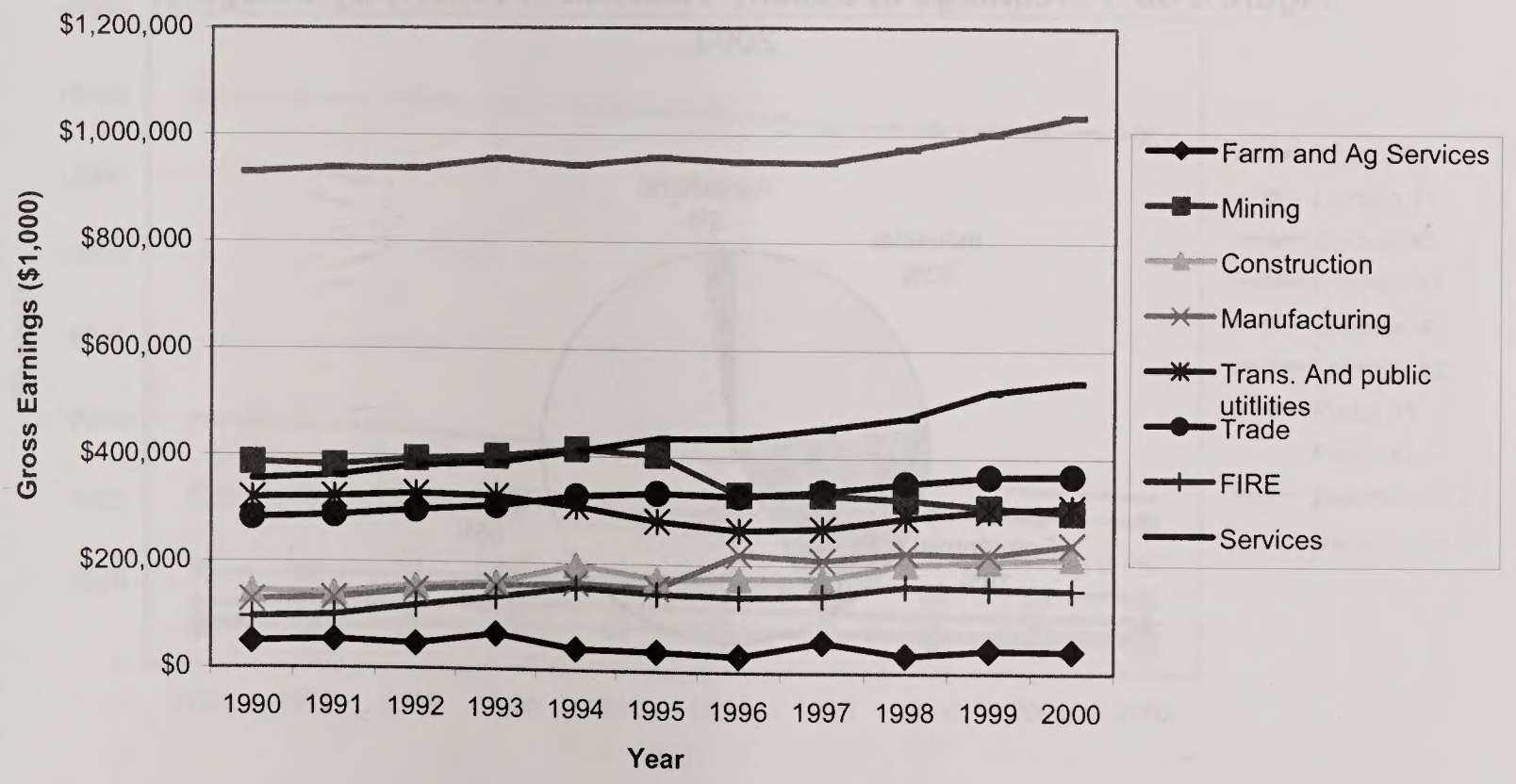


Figure 3-37 Average Real Earnings by Industry, 1990-2000 (2001$)

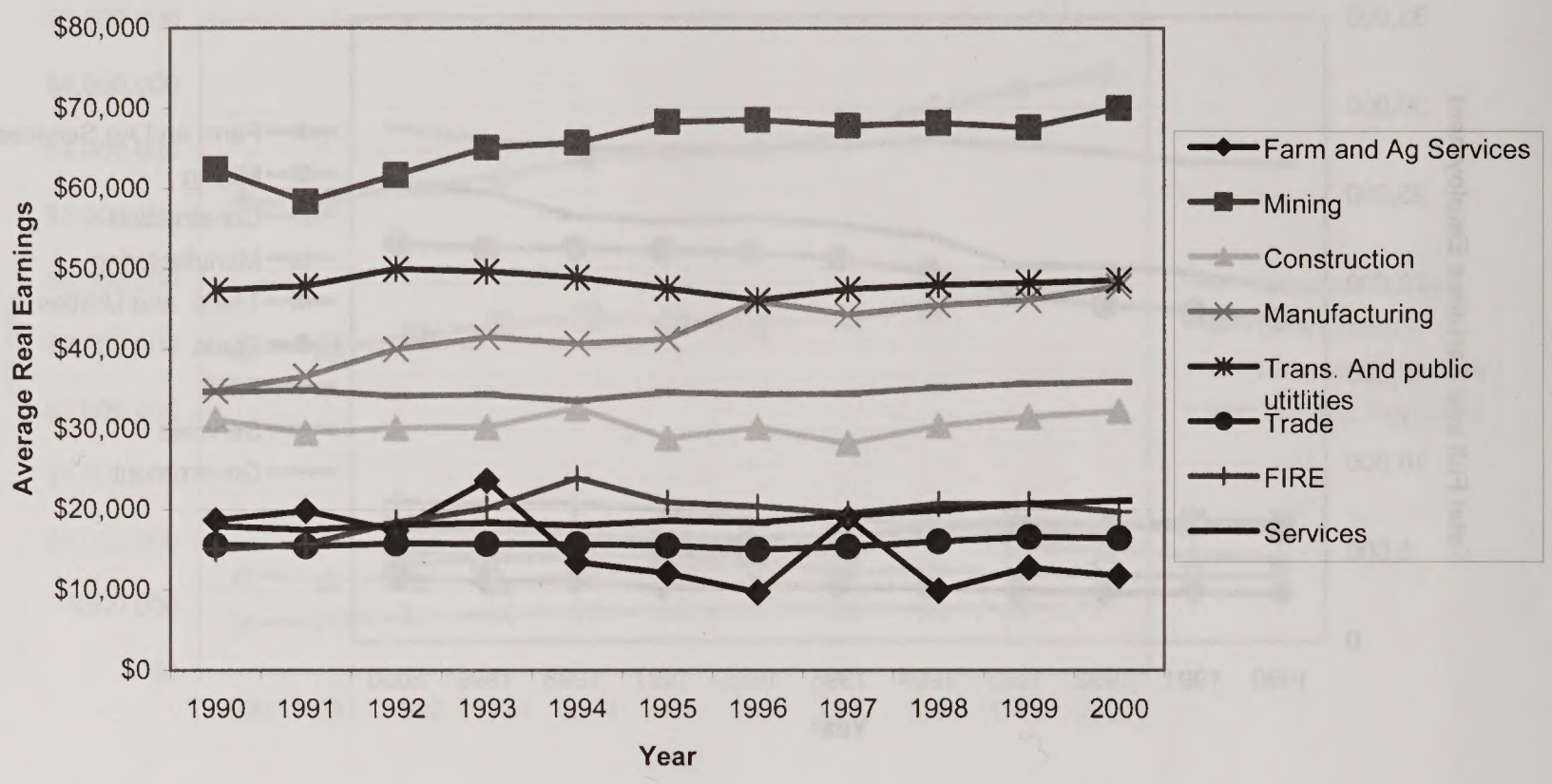


Figure 3-38 Percentage of Locally Assessed Property by Category, 2000

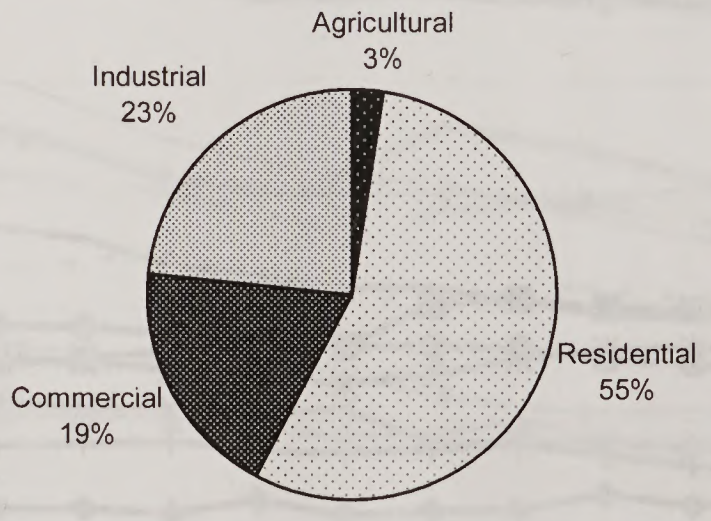


Figure 3-39 Percentage of State Assessed Property by Category Values for Counties in RMPPA, 2000

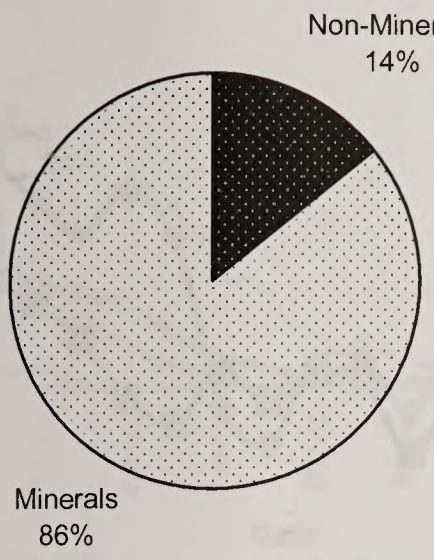


Figure 3-40 Annual PILT Payments, 1991-2000

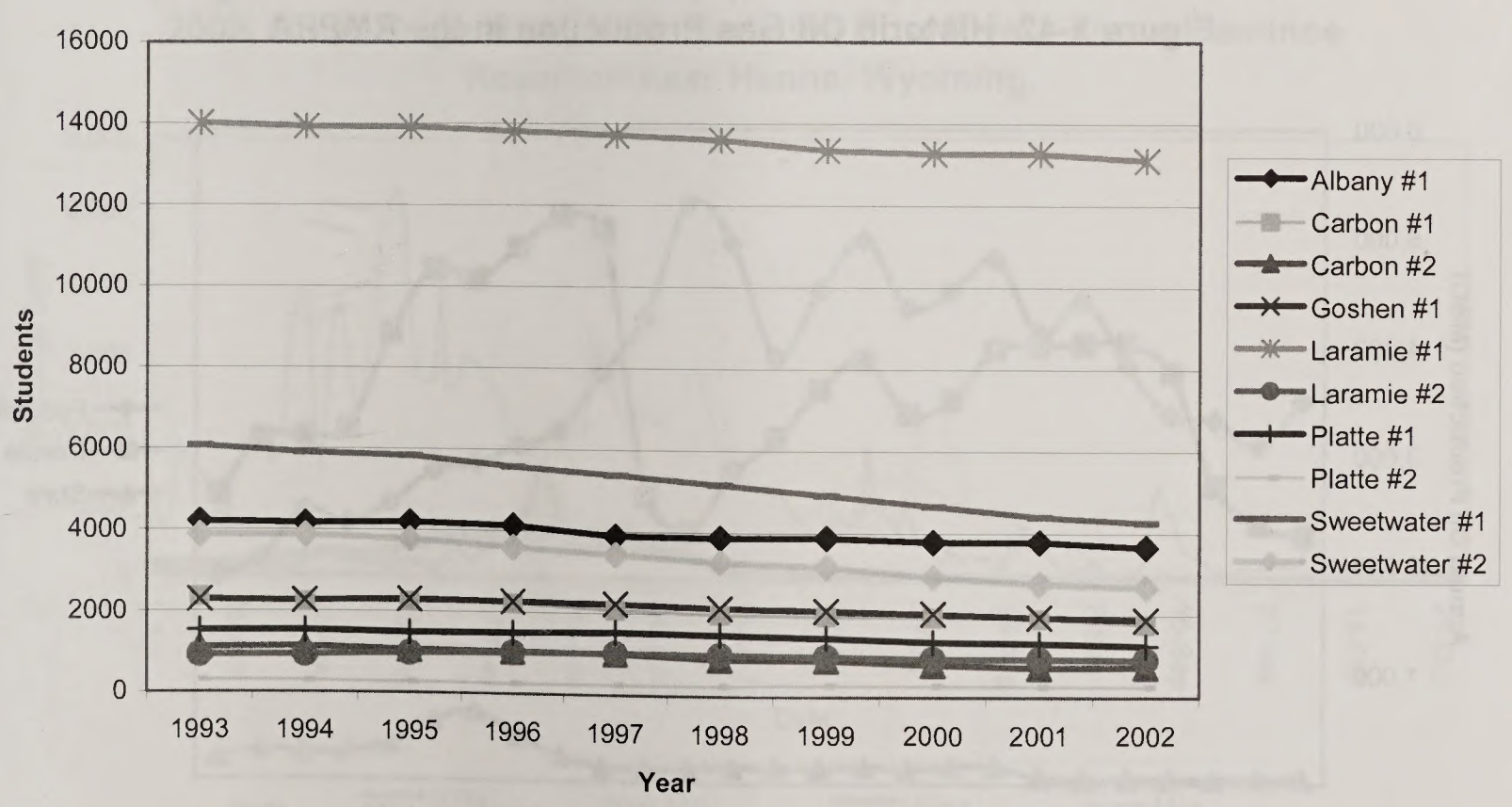


Figure 3-41 Historic Gas Production in the RMPPA Socioeconomic Study Area

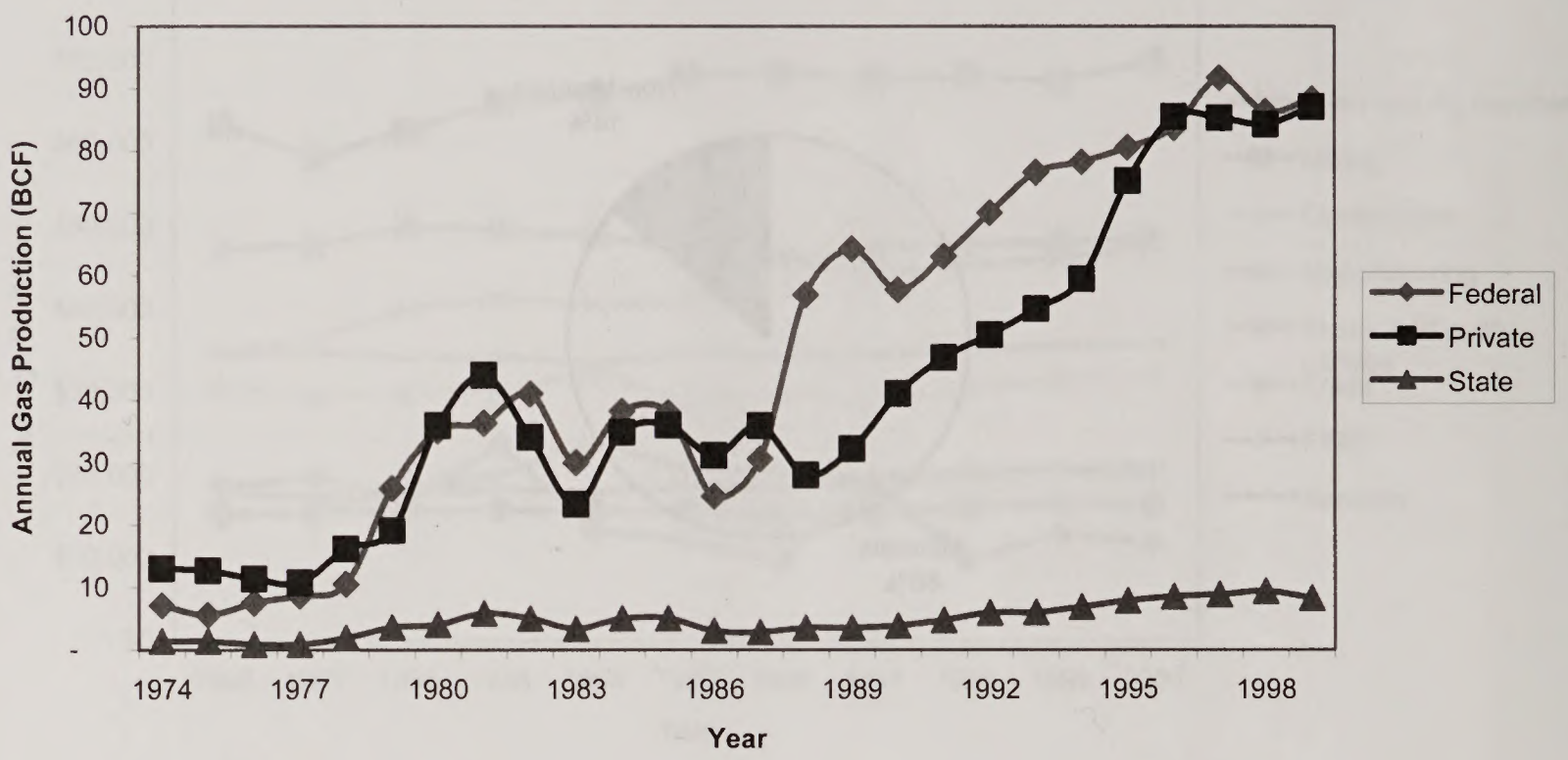


Figure 3-42 Historic Oil Gas Production in the RMPPA

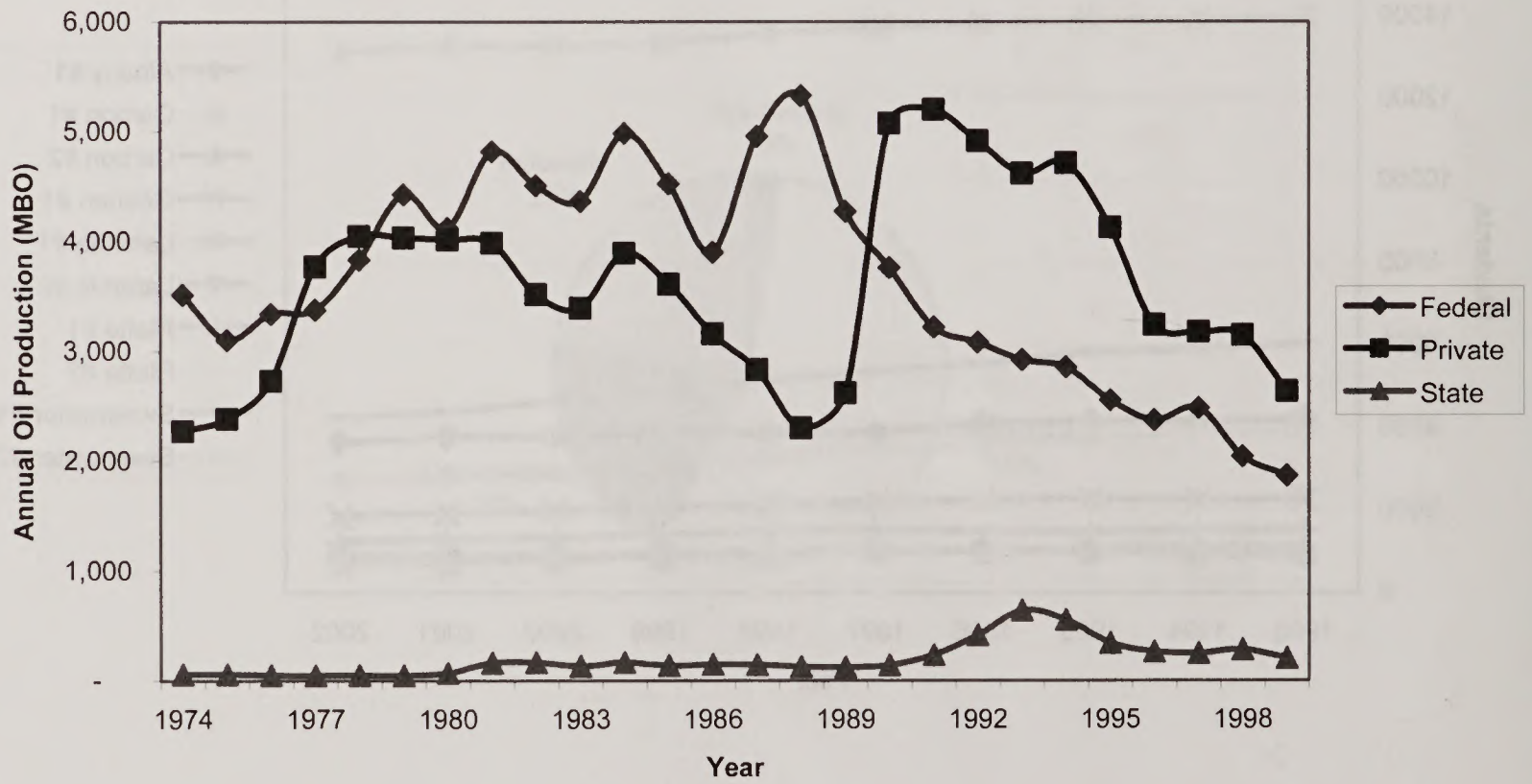


Figure 3-43 Streamflow 2003 (April - Oct.) and Statistics for 1940 - 2002, USGS Gage #06625000 Encampment River at Mouth, near Encampment, WY.

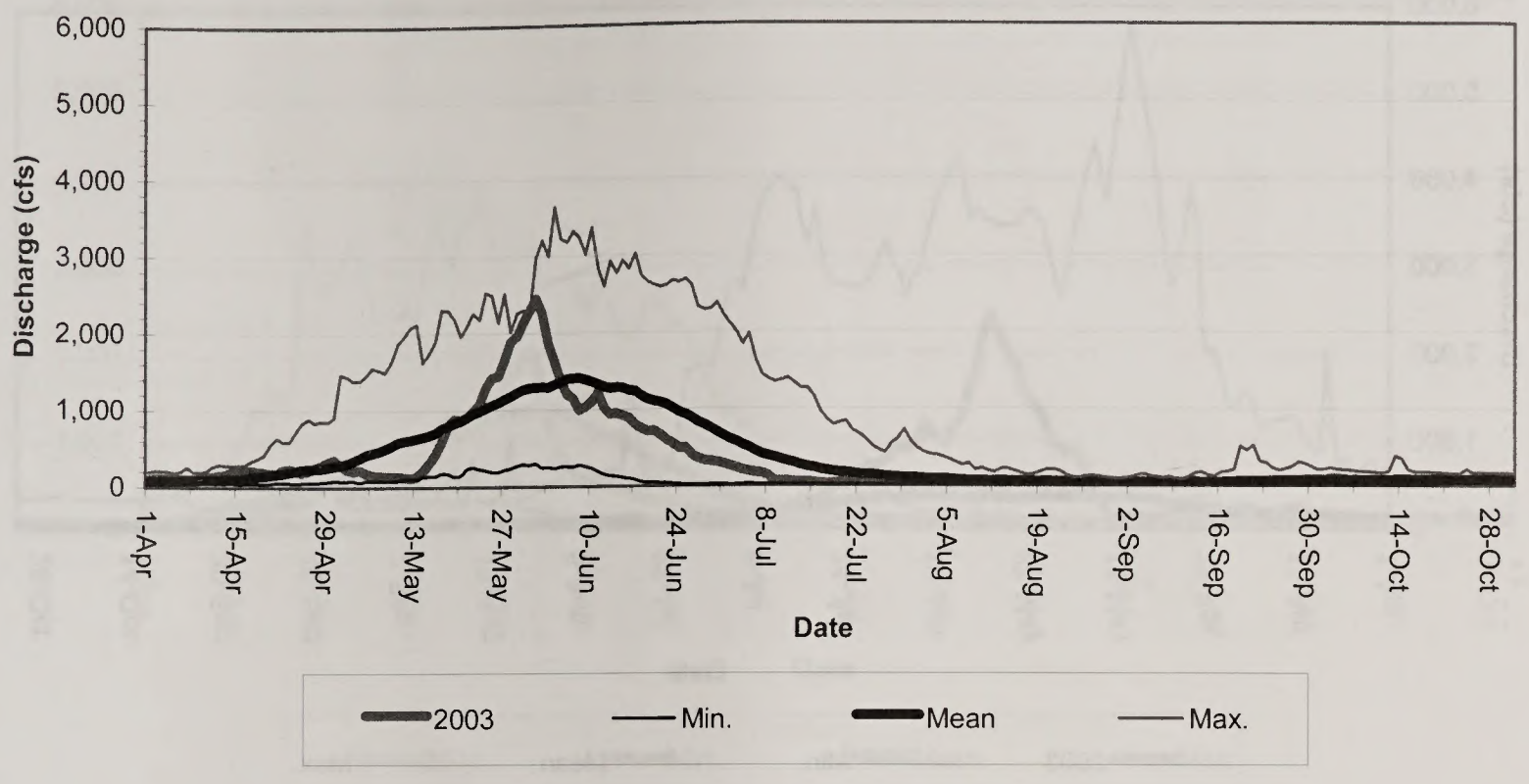


Figure 3-44 Streamflow 2003 (April - Oct.) and Statistics for 1939 - 2002, USGS Gage #06635000 Medicine Bow River, Above Seminoe Reservoir near Hanna, Wyoming.

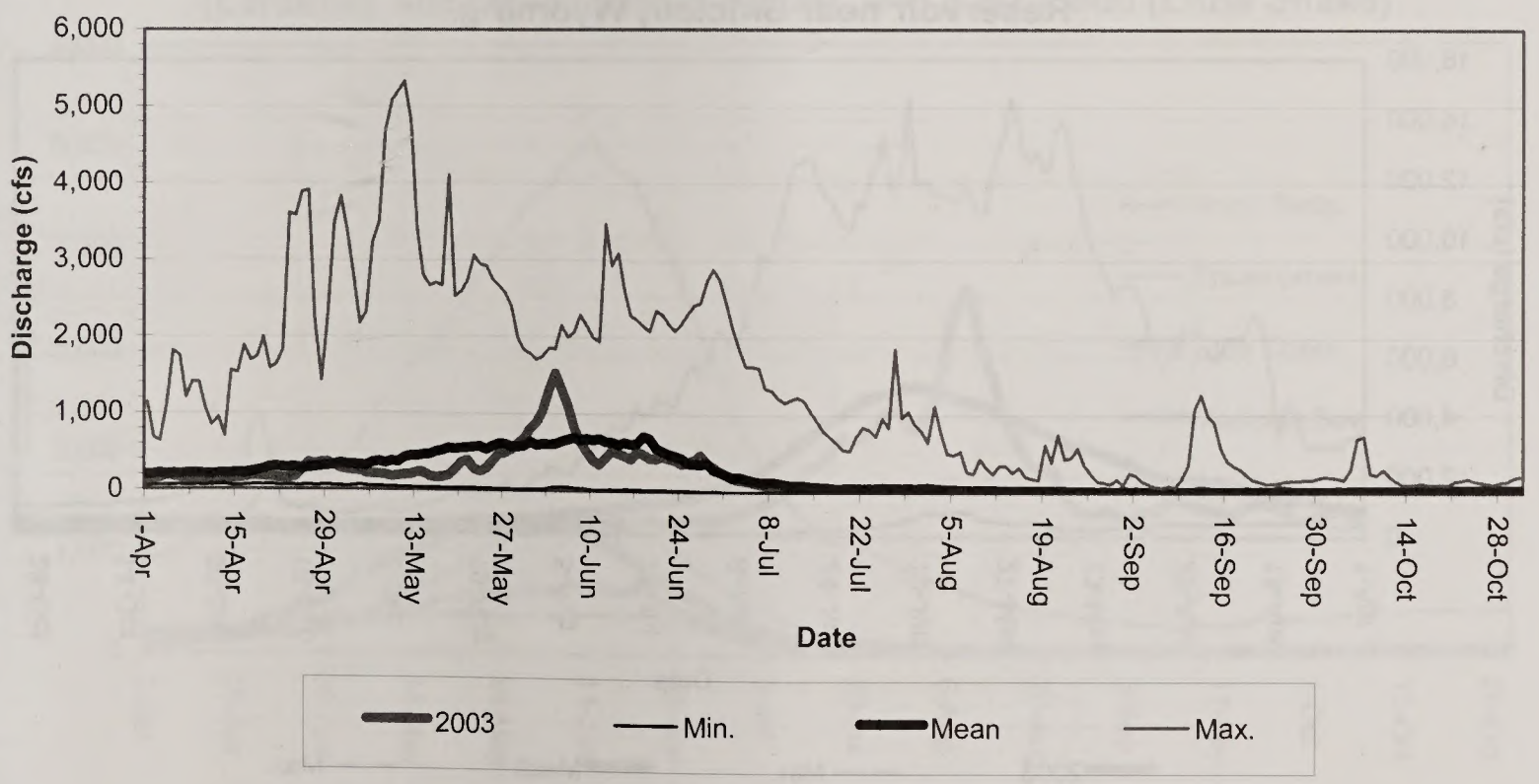


Figure 3-45 Streamflow 2003 (April - Oct.) and Statistics for 1915 - 2002, USGS Gage #06670500 Laramie River near Fort Laramie, WY.

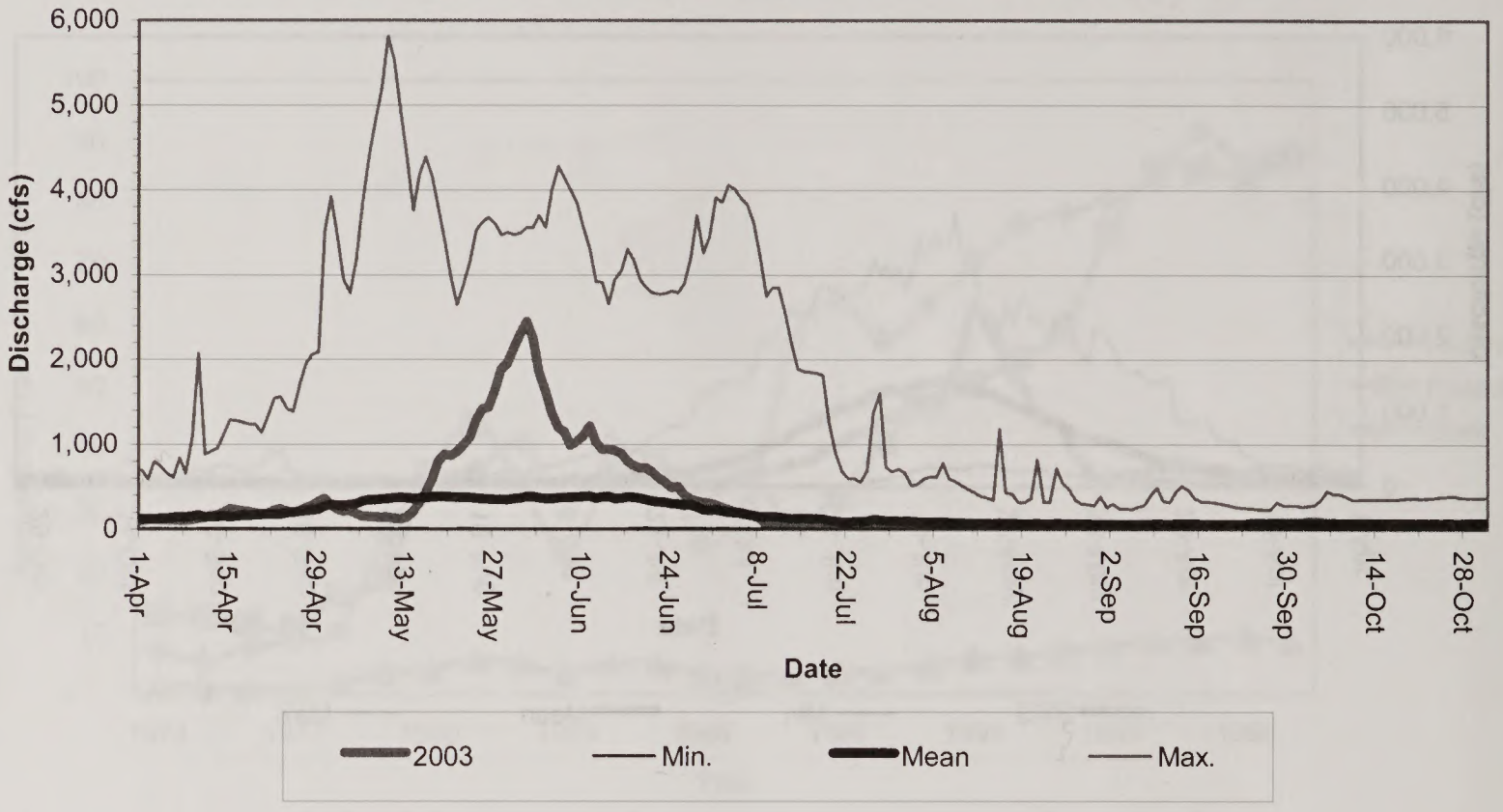


Figure 3-46 Streamflow 2003 (April - Oct.) and Statistics for 1939 - 2002, USGS Gage #06630000 North Platte River, Above Seminoe Reservoir near Sinclair, Wyoming.

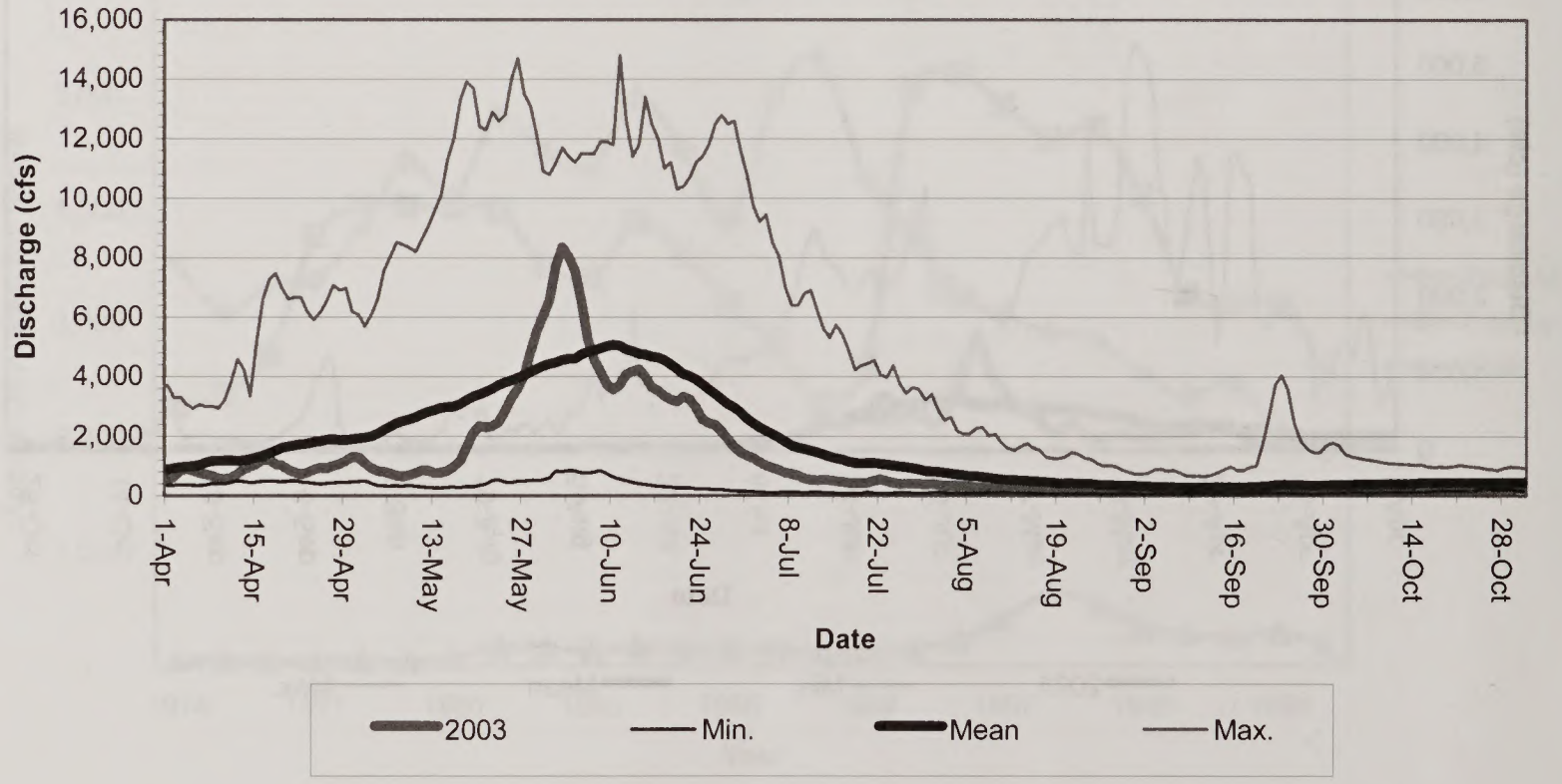


Figure 3-47 Streamflow 2003 (April - Oct.) and Statistics for 1943 - 2002, USGS Gage #09253000 Little Snake River near Slater, CO.

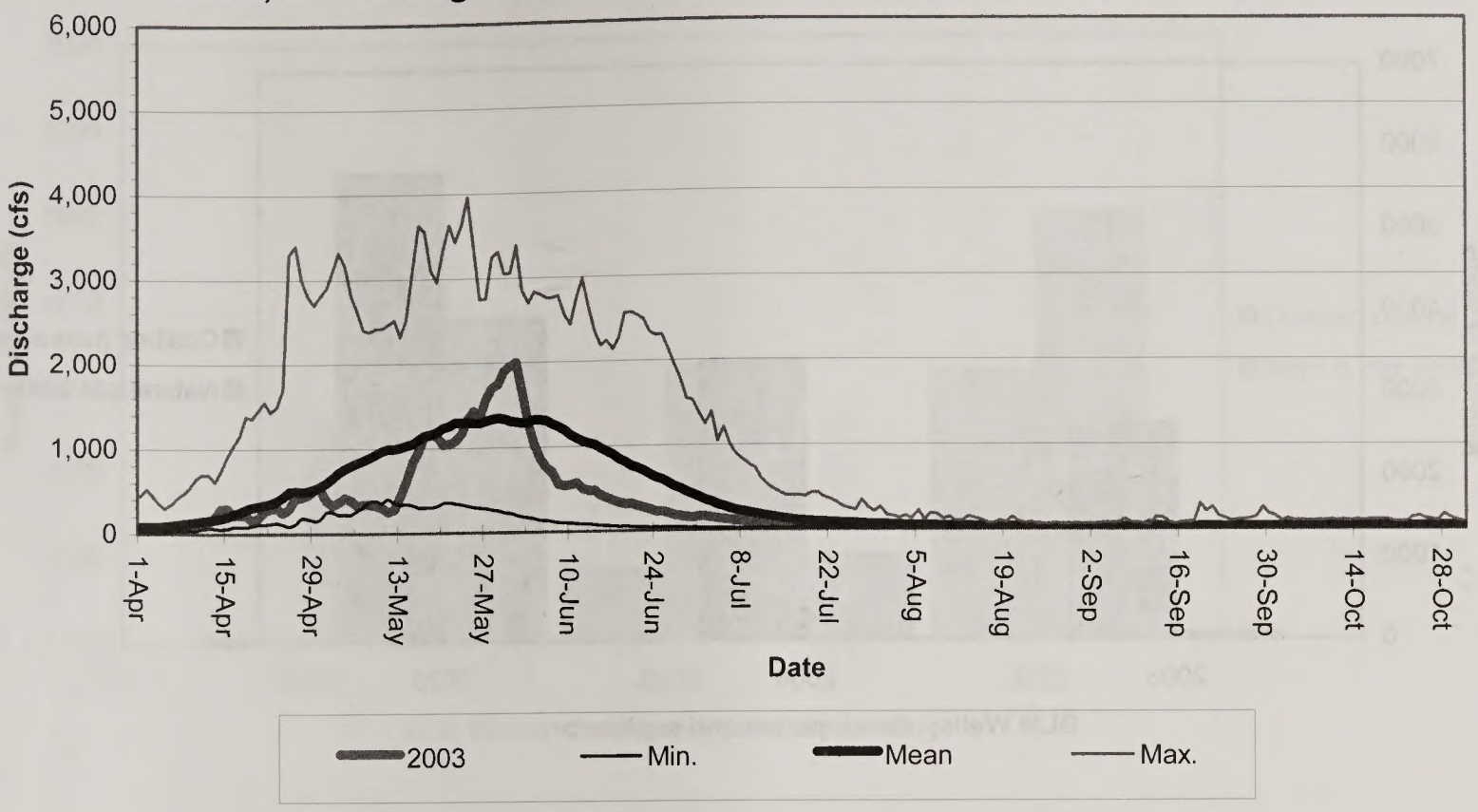


Figure 3-48 Mean Streamflow (April - Oct.) for USGS Gages #06625000 (Encampment), #06635000 (Medicine Bow), #06670500 (Laramie), #06630000 (North Platte), and #09253000 (Little Snake).

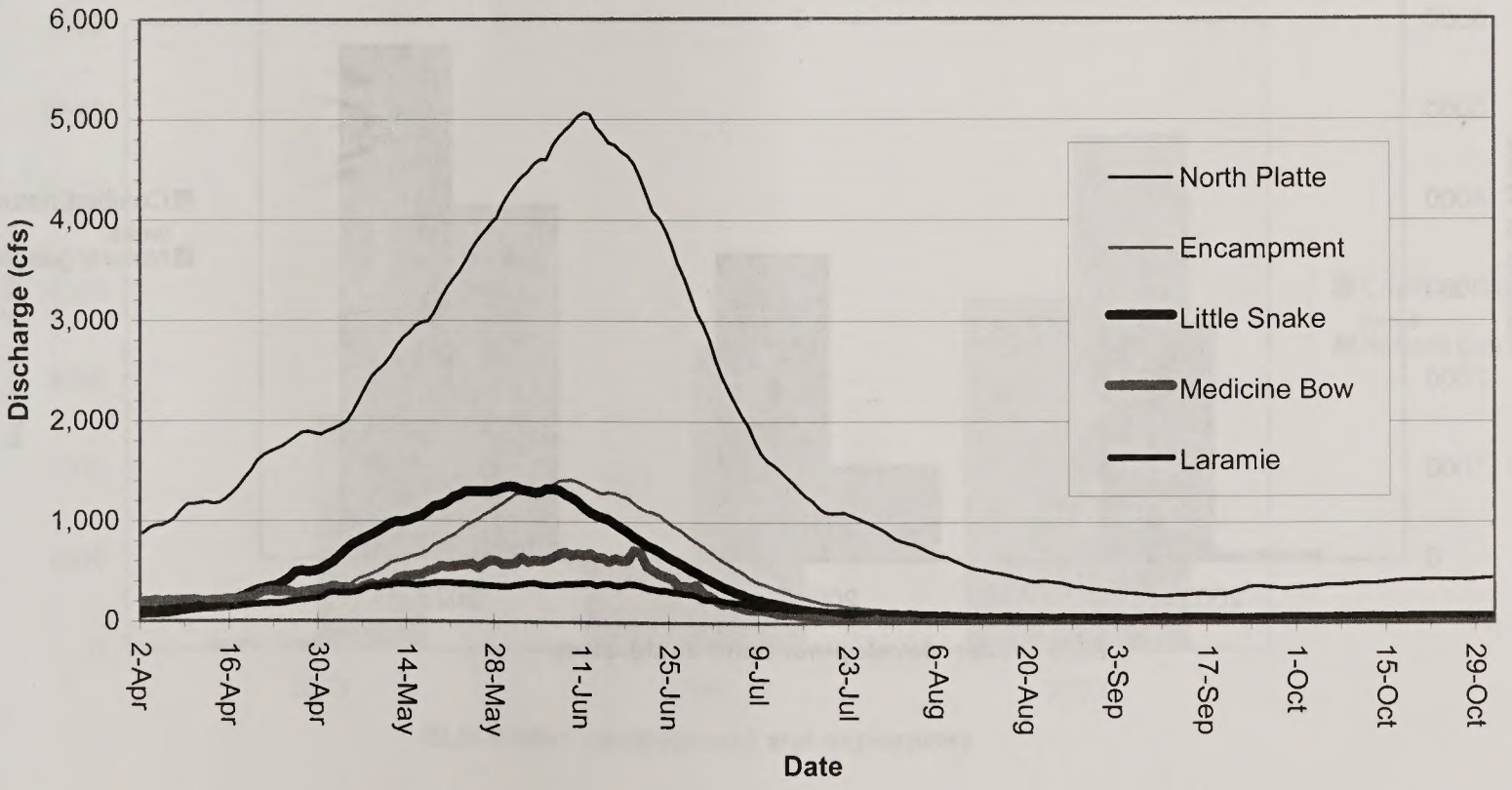


Figure 4-1 Potential Number of BLM Wells – Alternative 1

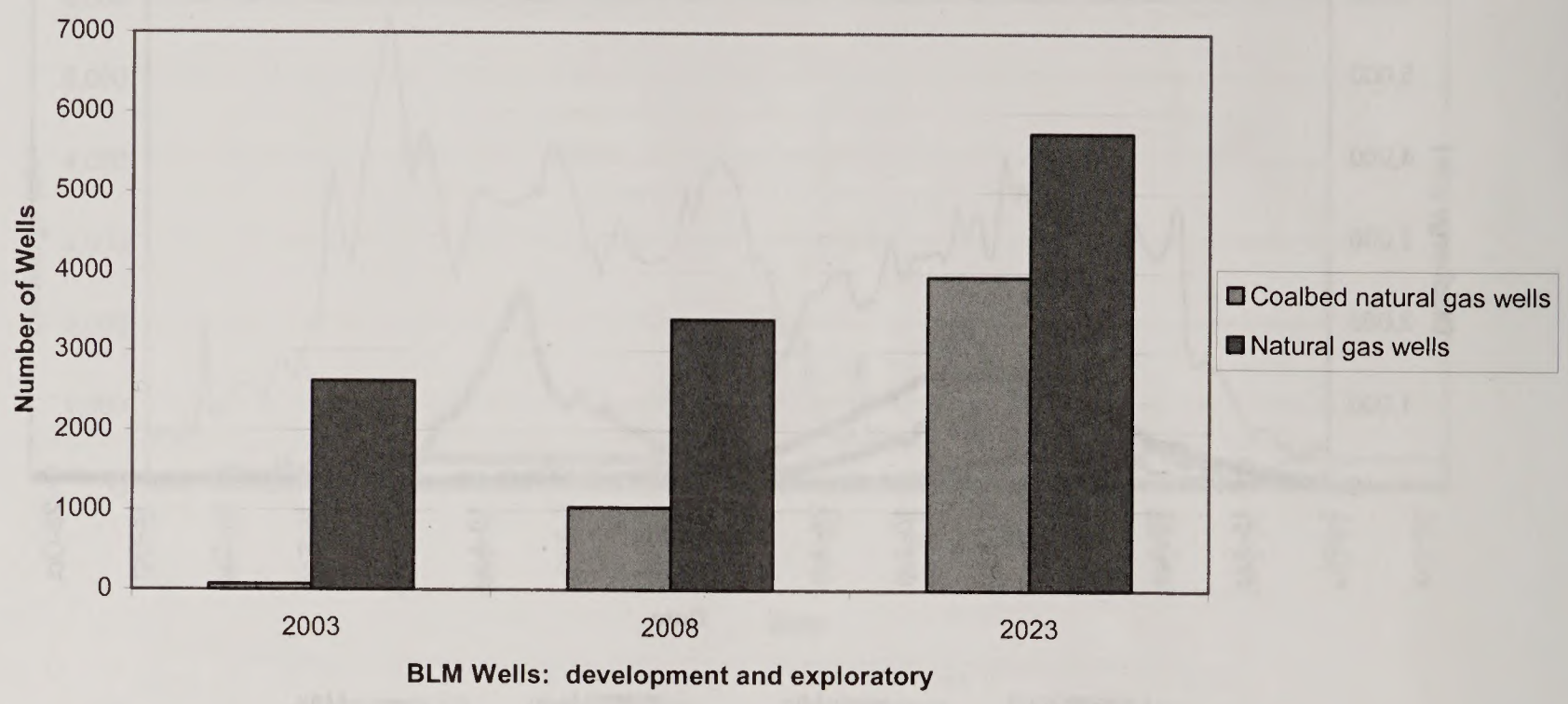


Figure 4-2 Potential Number of BLM Wells – Alternative 2

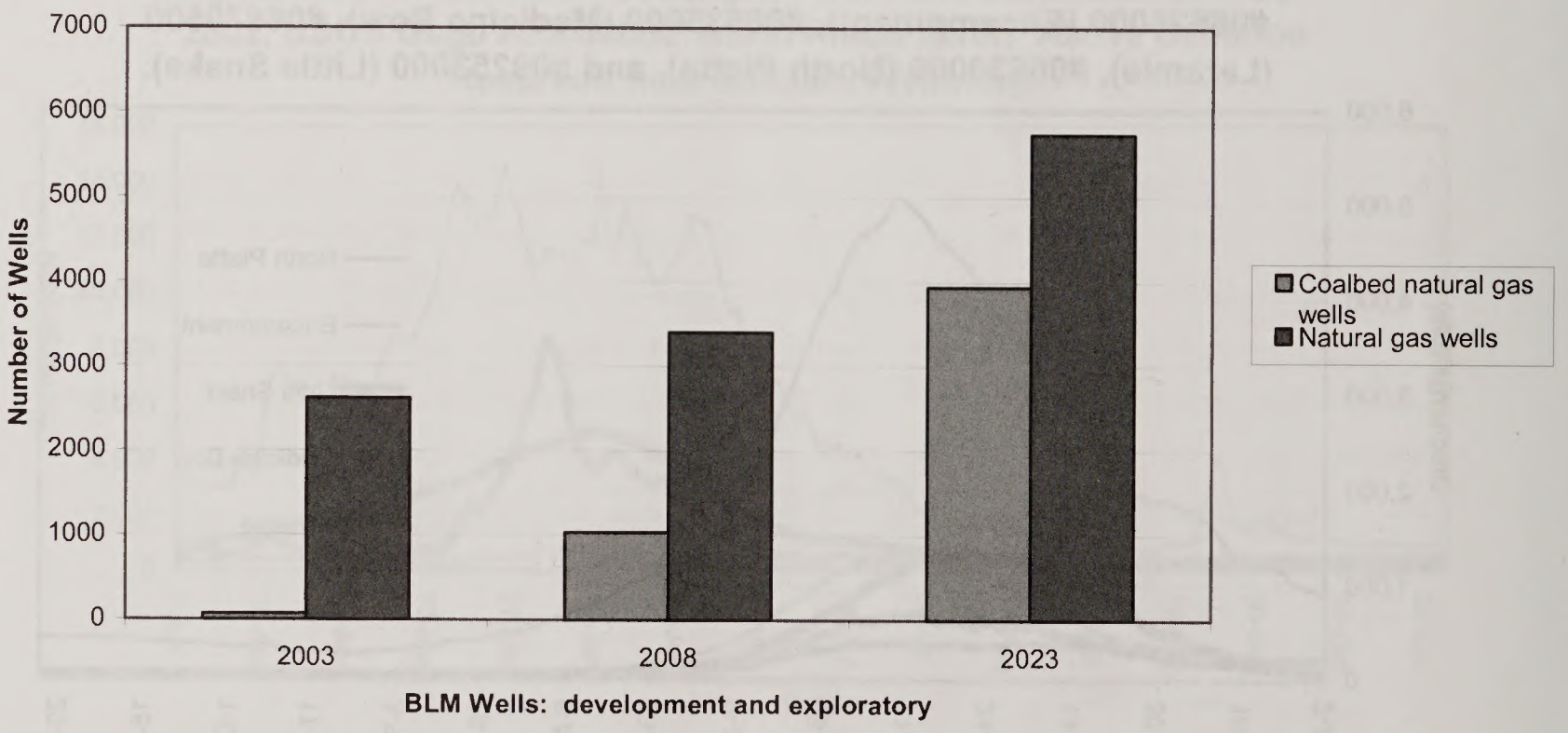


Figure 4-3 Potential Number of BLM Wells – Alternative 3

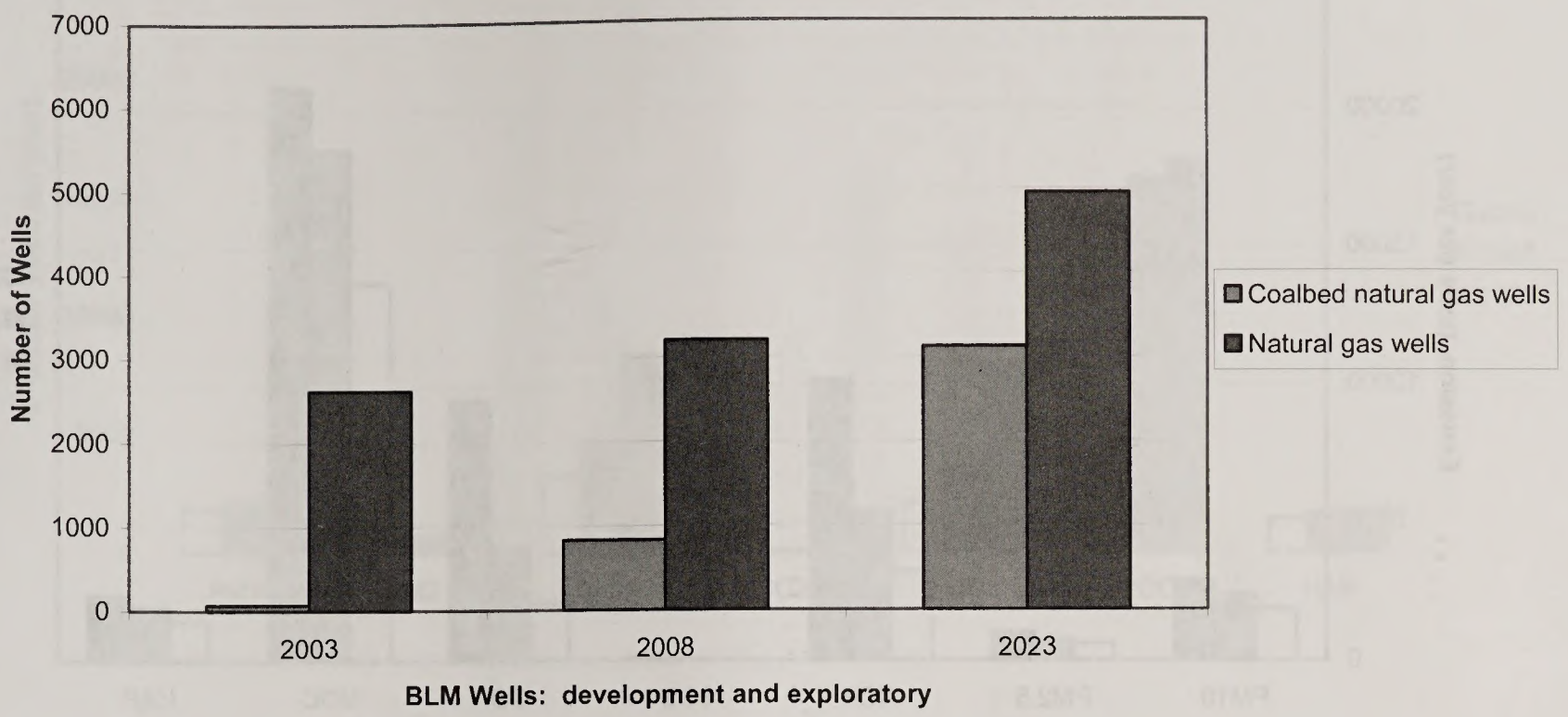


Figure 4-4 Potential Number of BLM Wells – Alternative 4

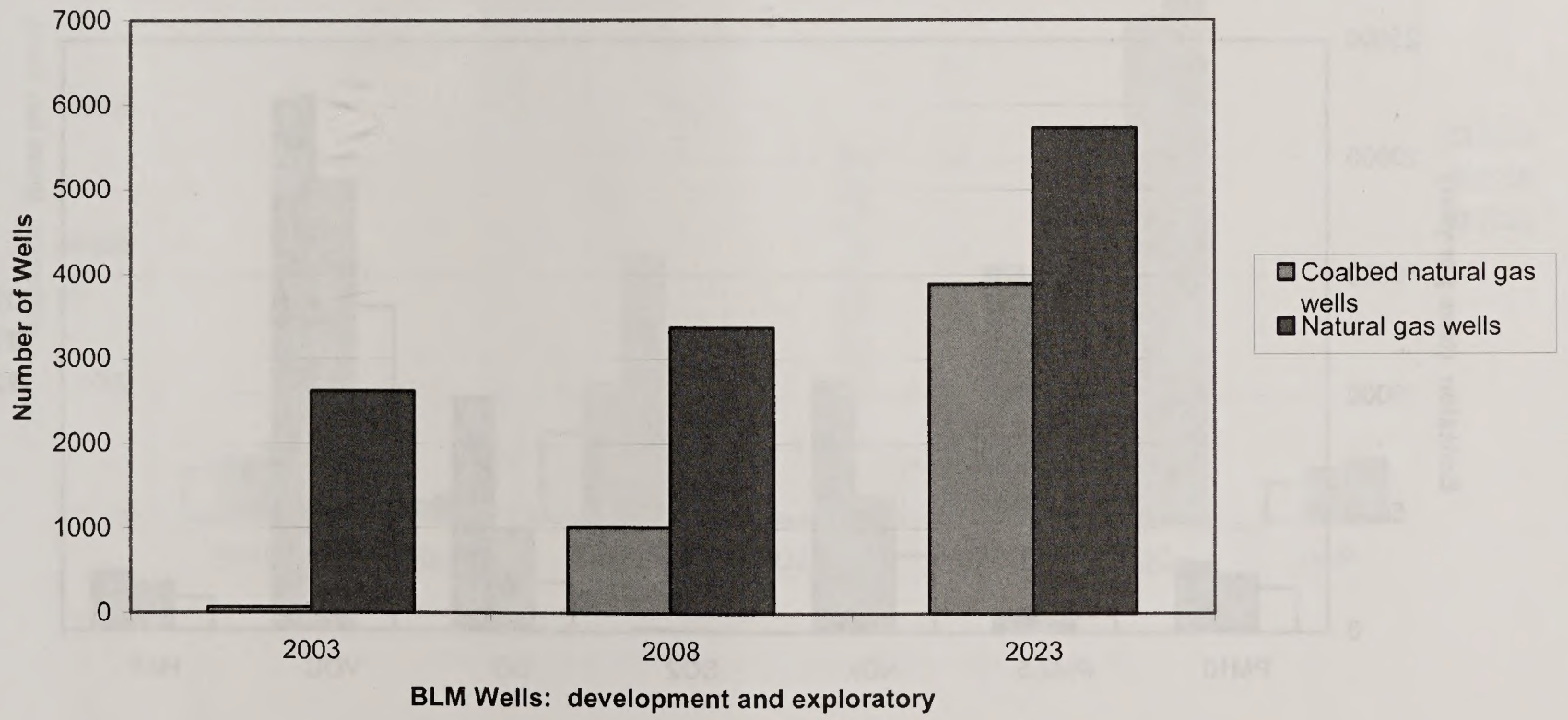


Figure 4-5 Potential Emissions from BLM Sources – Alternative 1

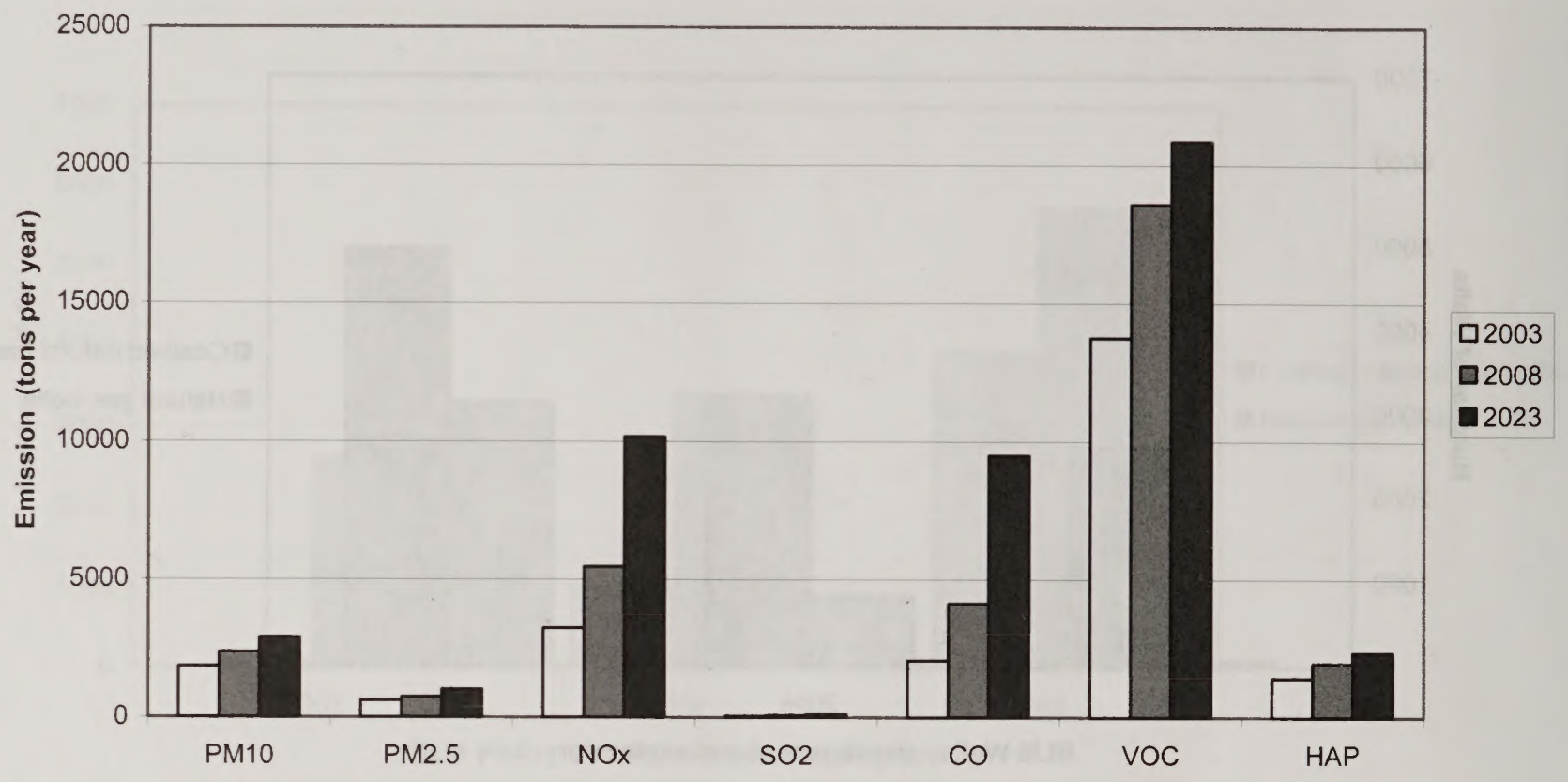


Figure 4-6 Potential Emissions from BLM Sources – Alternative 2

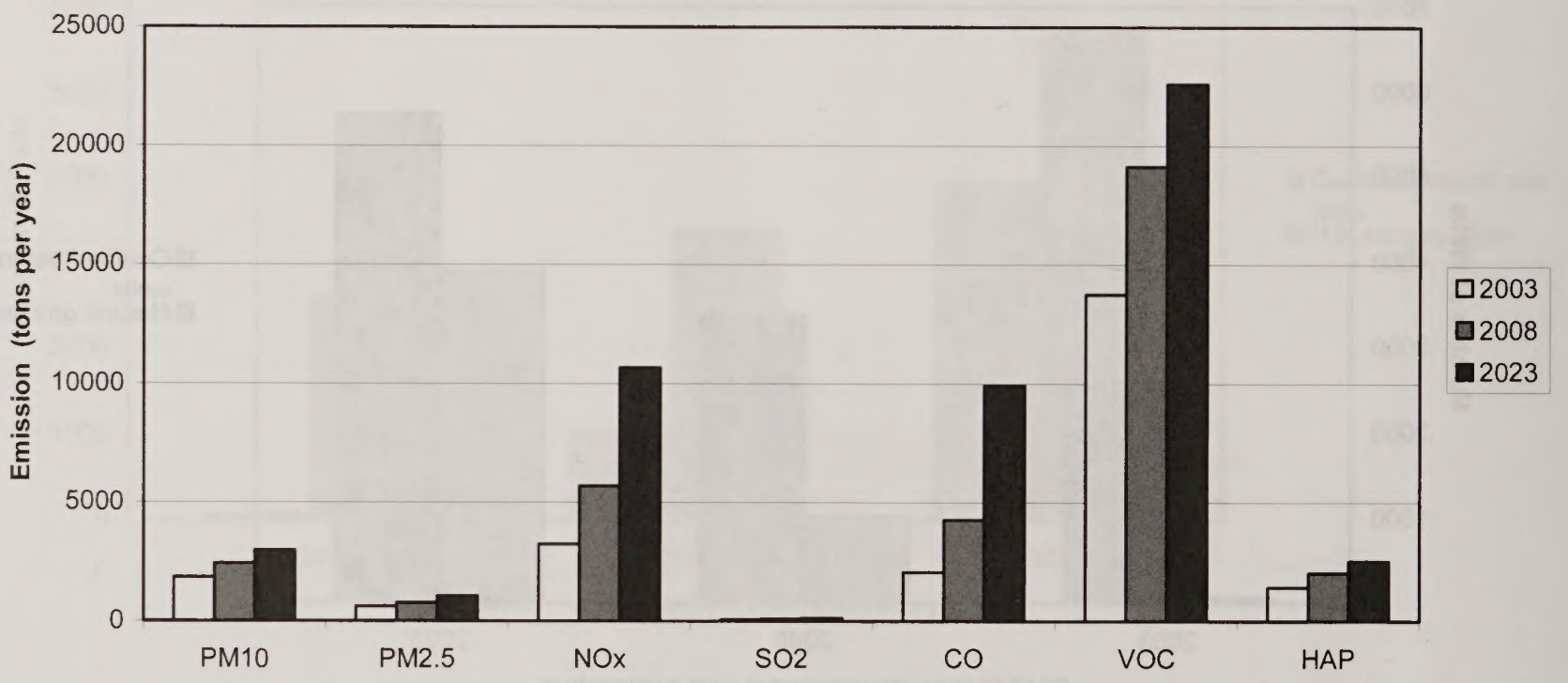


Figure 4-7 Potential Emissions from BLM Sources – Alternative 3

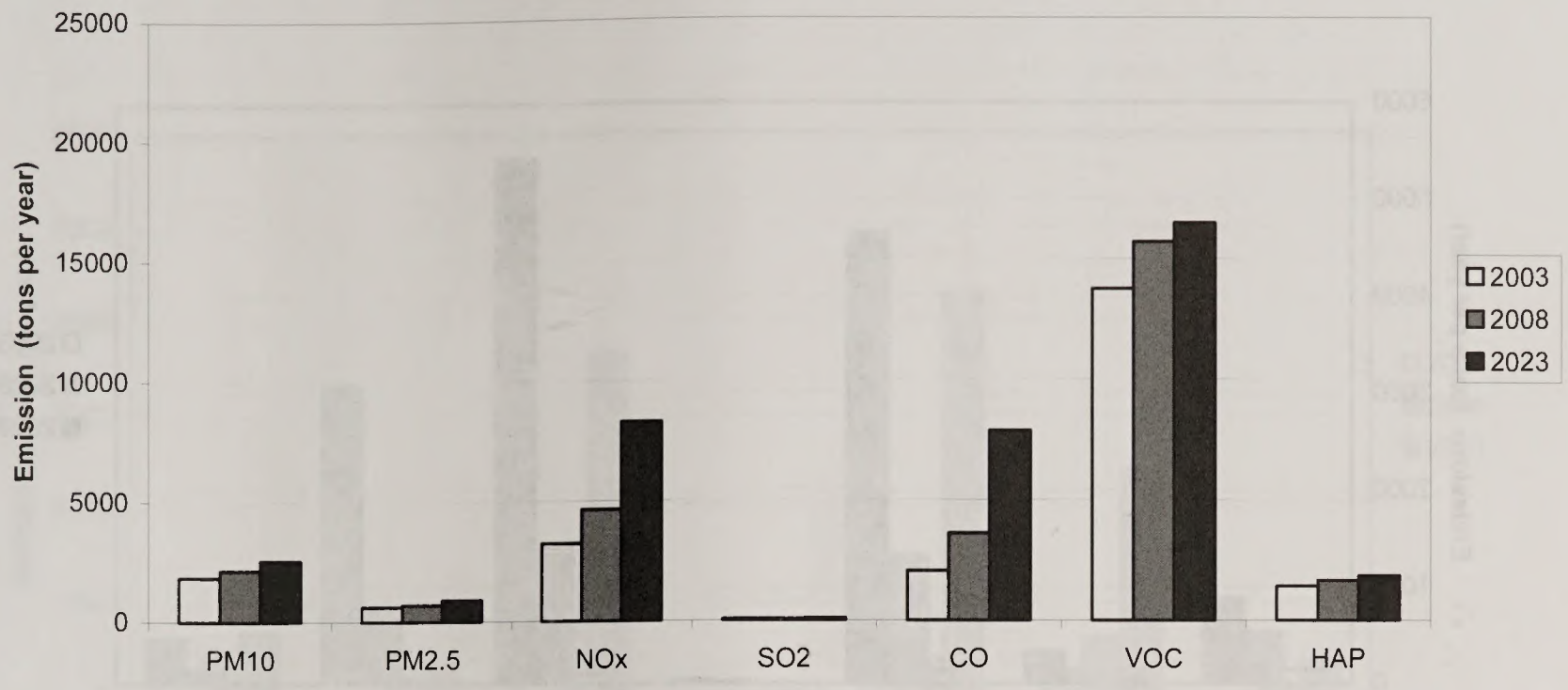


Figure 4-8 Potential Emissions from BLM Sources – Alternative 4

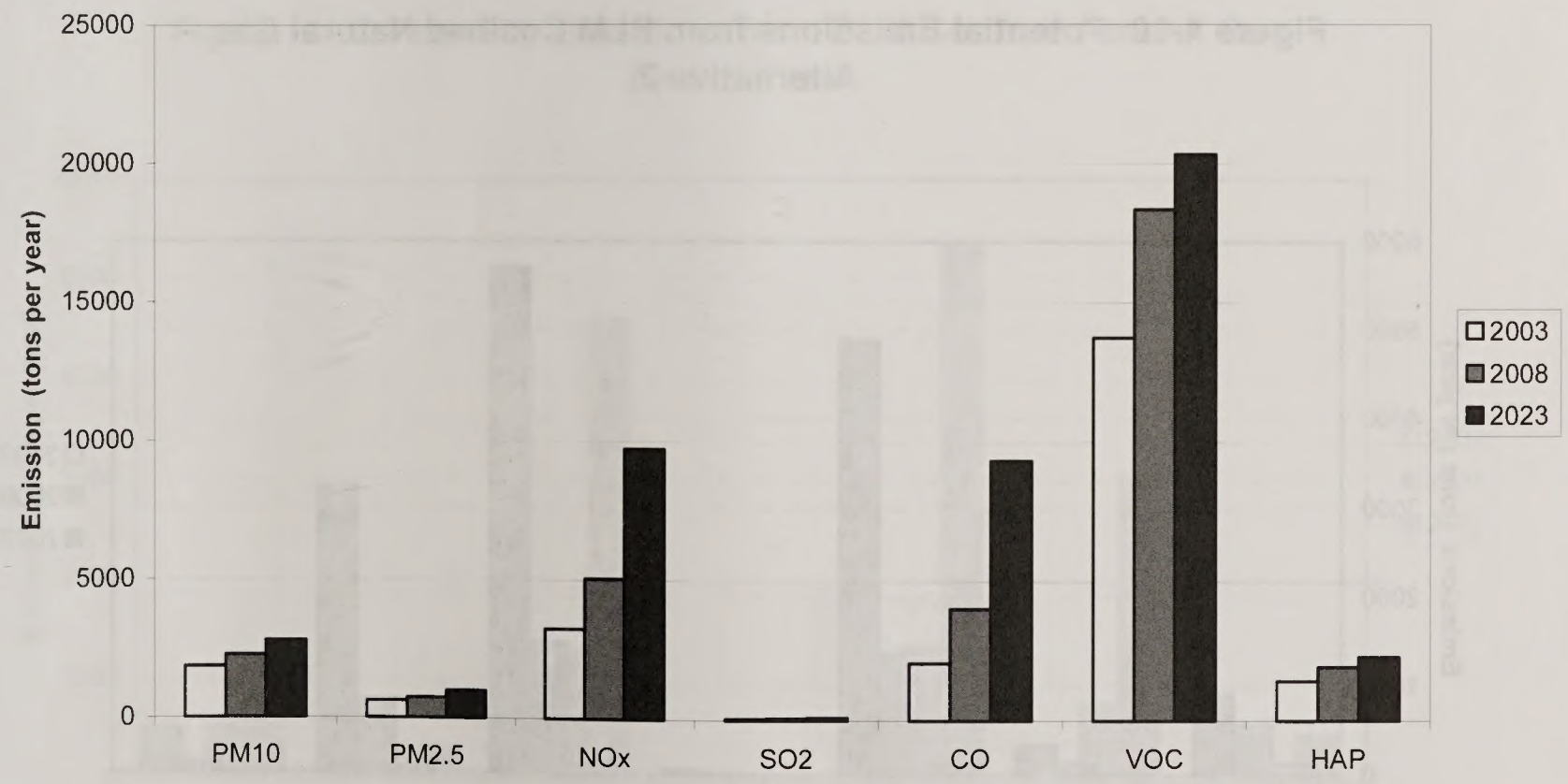


Figure 4-9 Potential Emissions from BLM Coalbed Natural Gas – Alternative 1

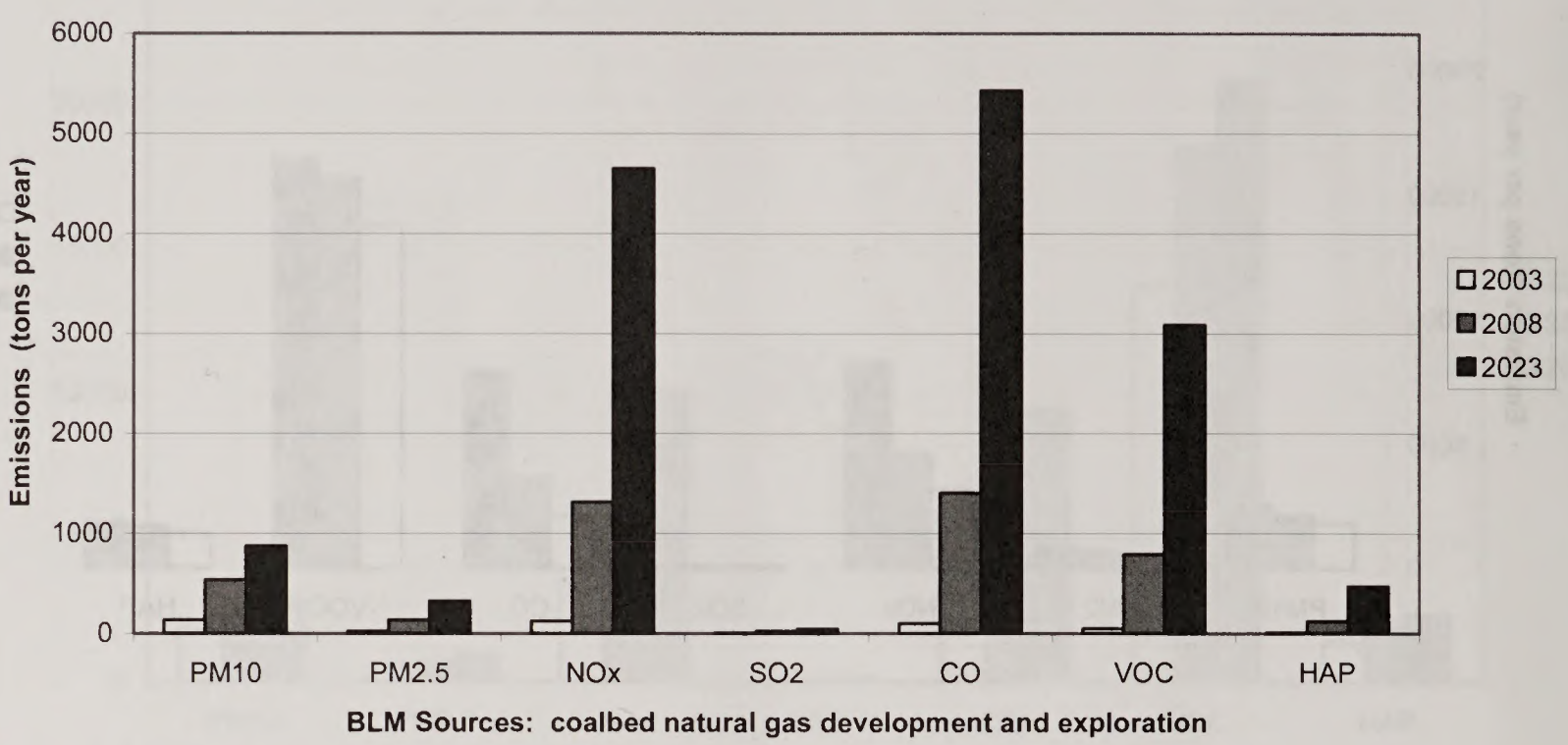


Figure 4-10 Potential Emissions from BLM Coalbed Natural Gas – Alternative 2

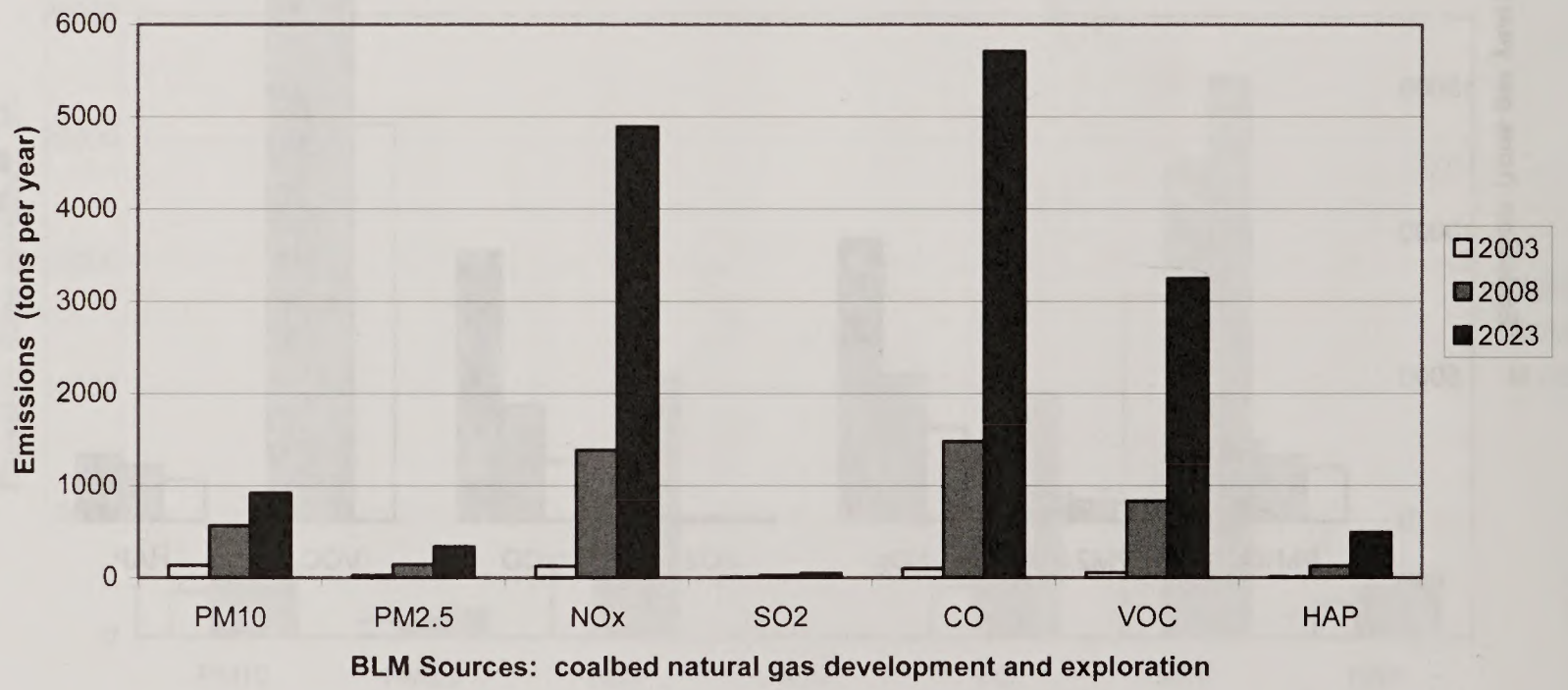


Figure 4-11 Potential Emissions from BLM Coalbed Natural Gas – Alternative 3

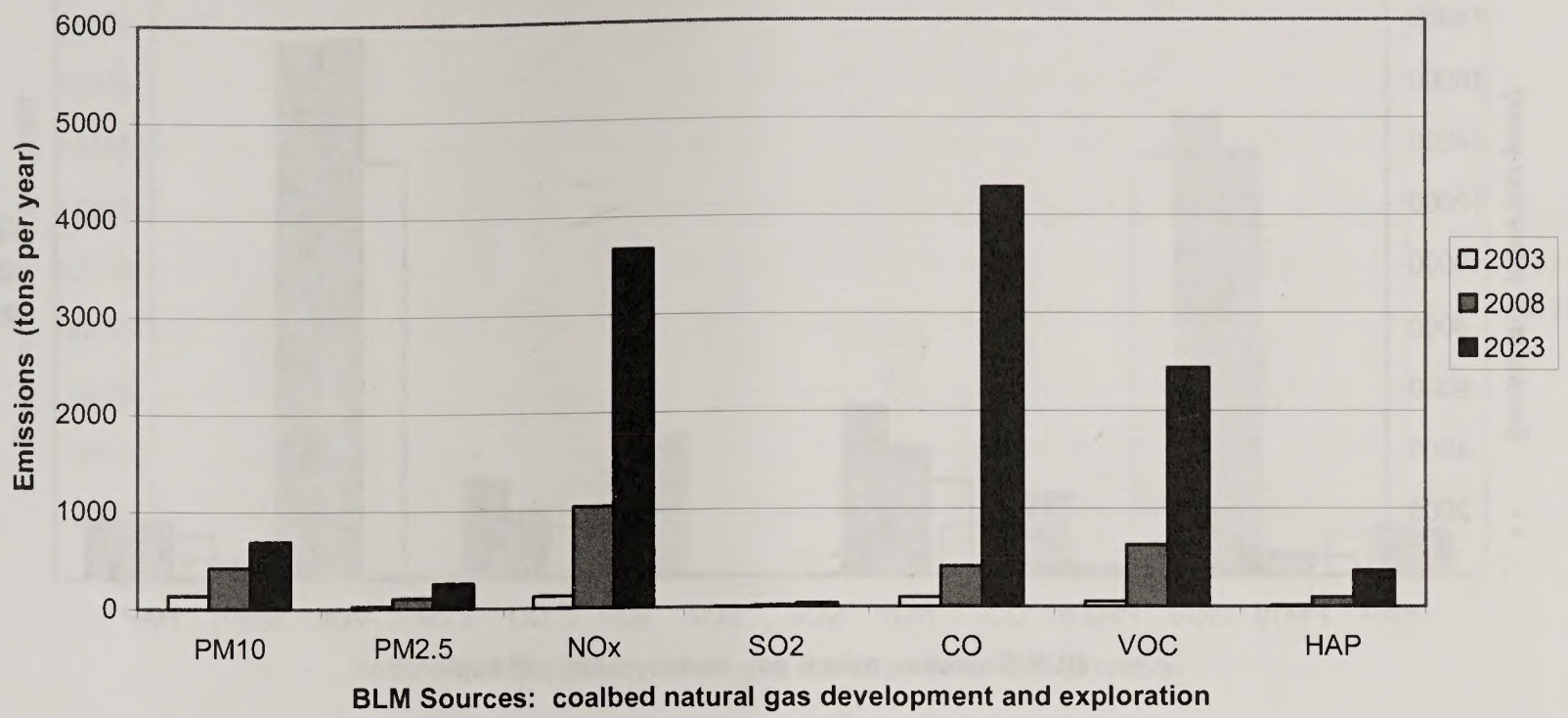


Figure 4-12 Potential Emissions from BLM Coalbed Natural Gas – Alternative 4

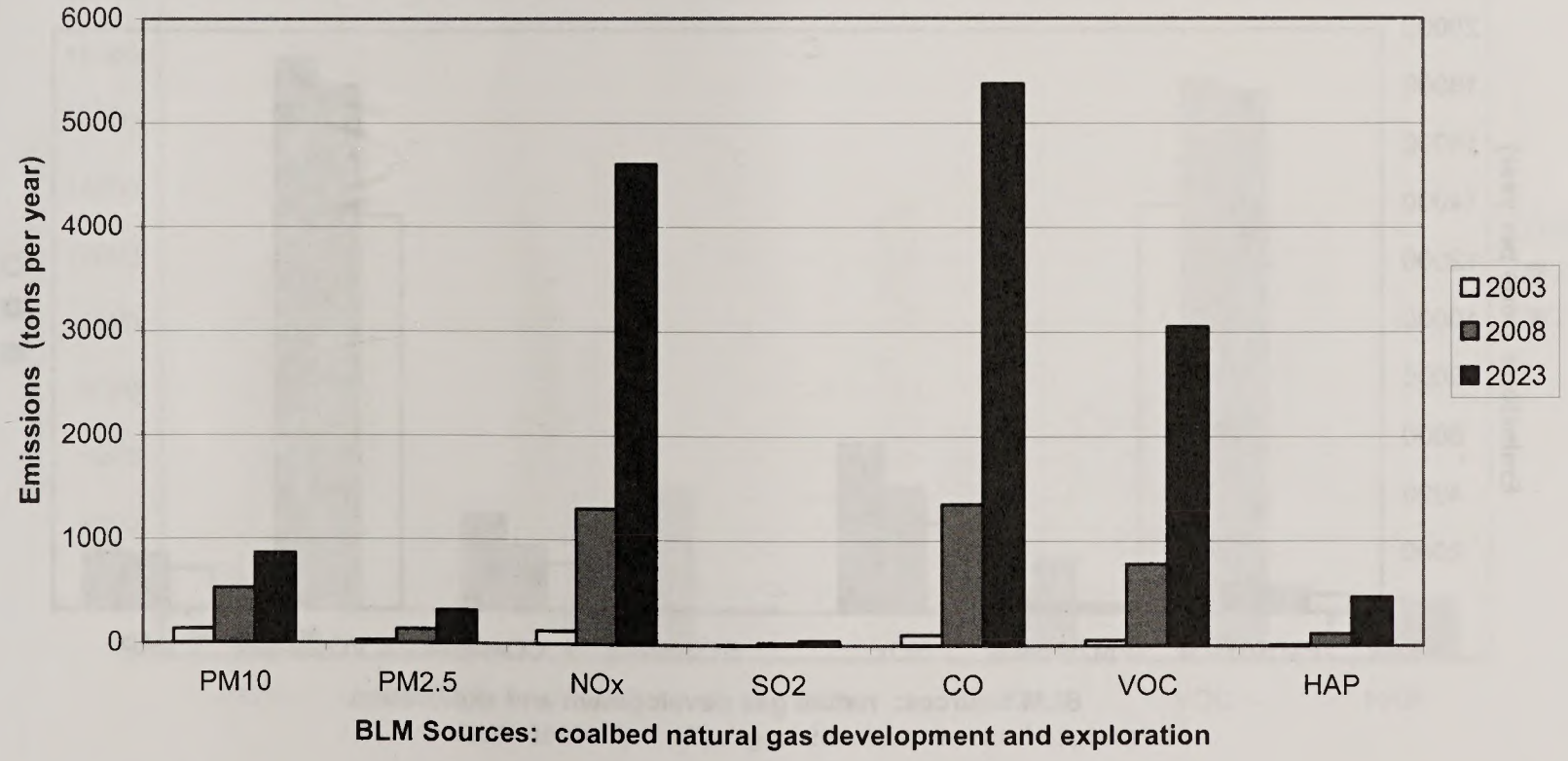


Figure 4-13 Potential Emissions from BLM Conventional Oil and Gas – Alternative 1

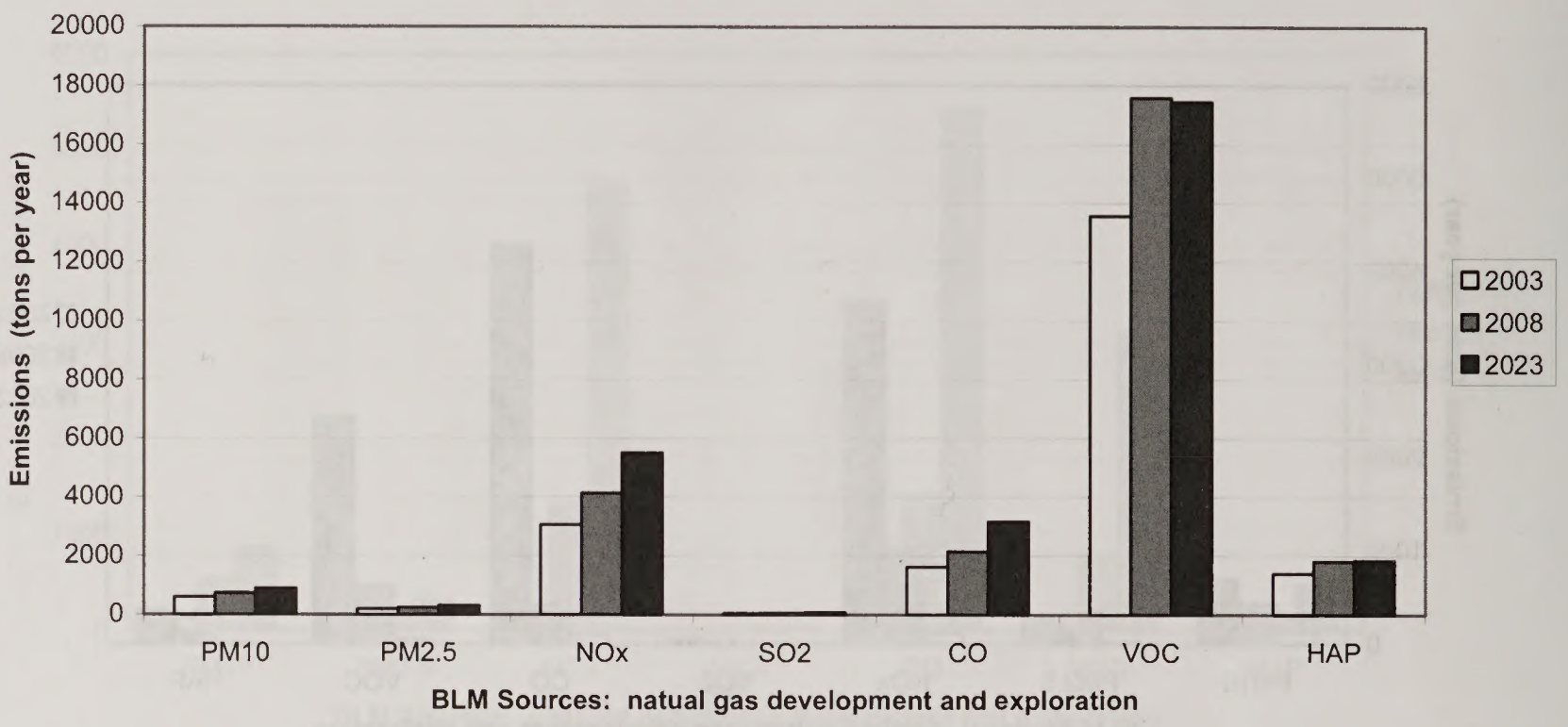


Figure 4-14 Potential Emissions from BLM Conventional Oil and Gas – Alternative 2

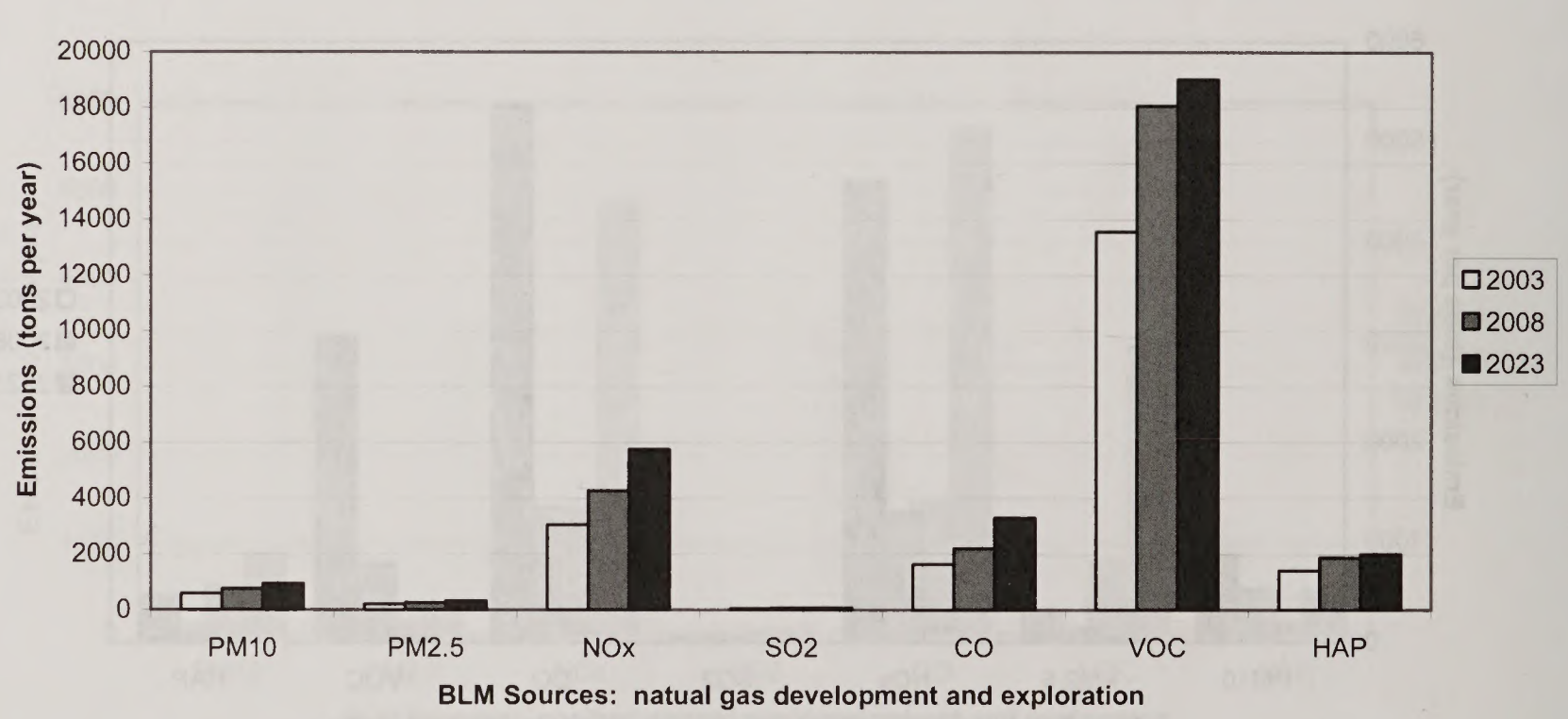


Figure 4-15 Potential Emissions from BLM Conventional Oil and Gas – Alternative 3

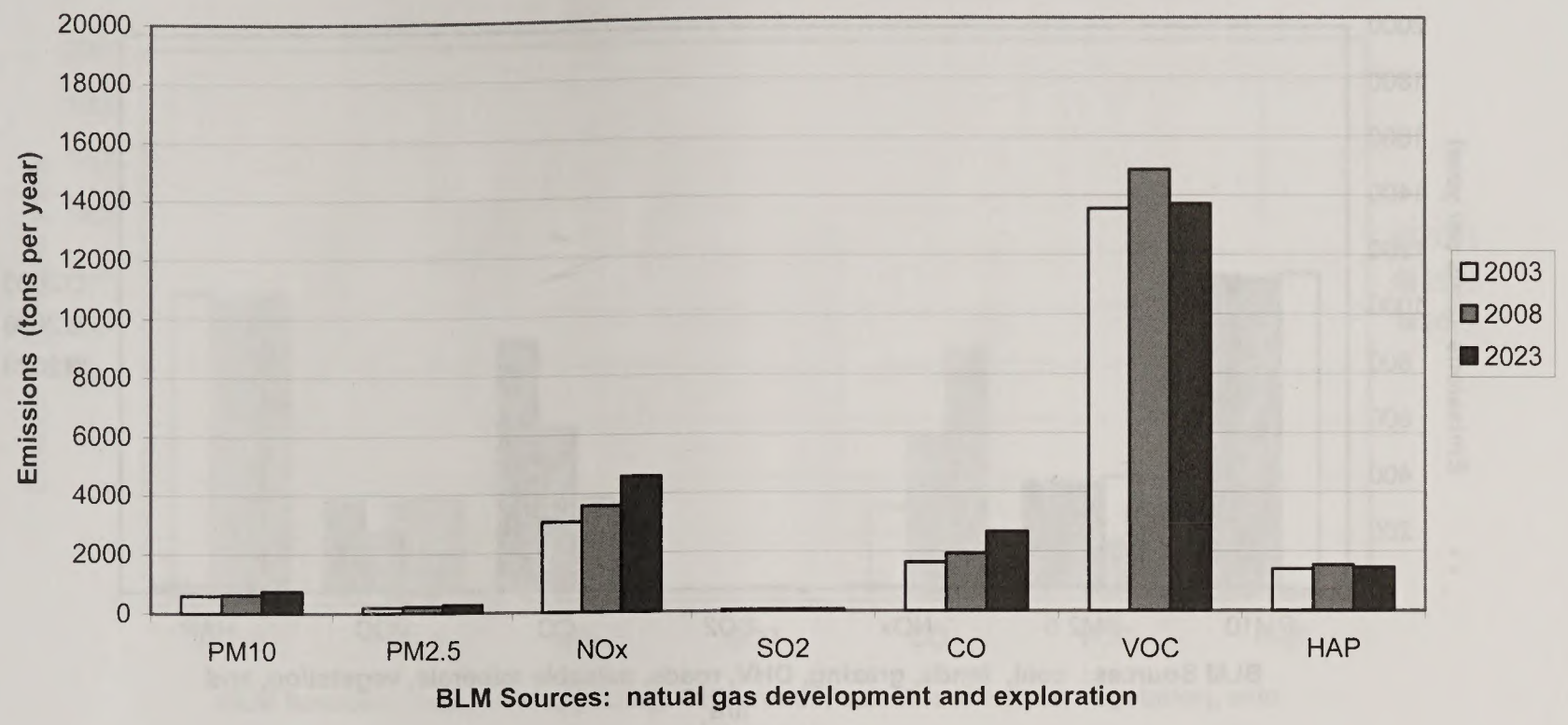


Figure 4-16 Potential Emissions from BLM Conventional Oil and Gas – Alternative 4

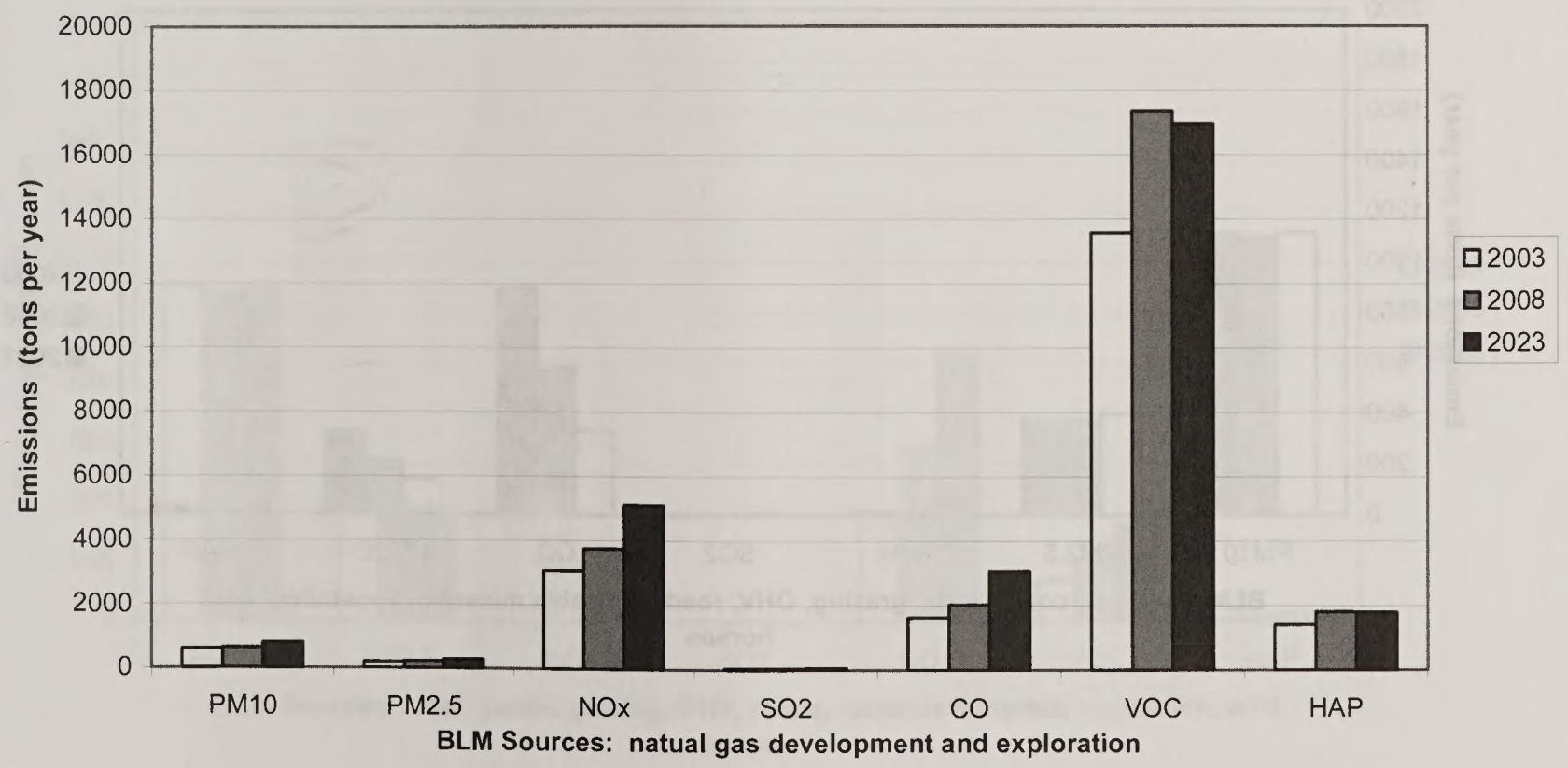
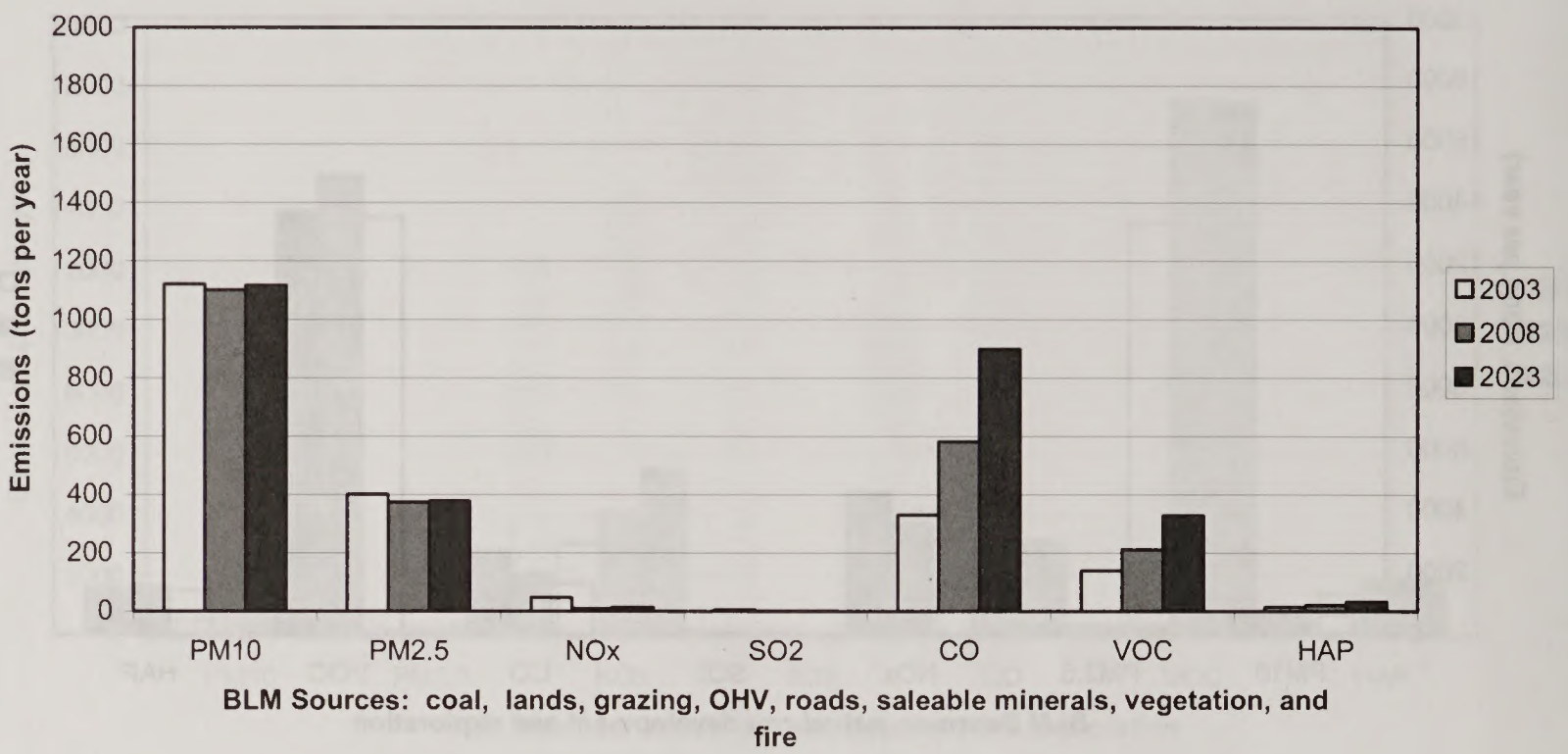
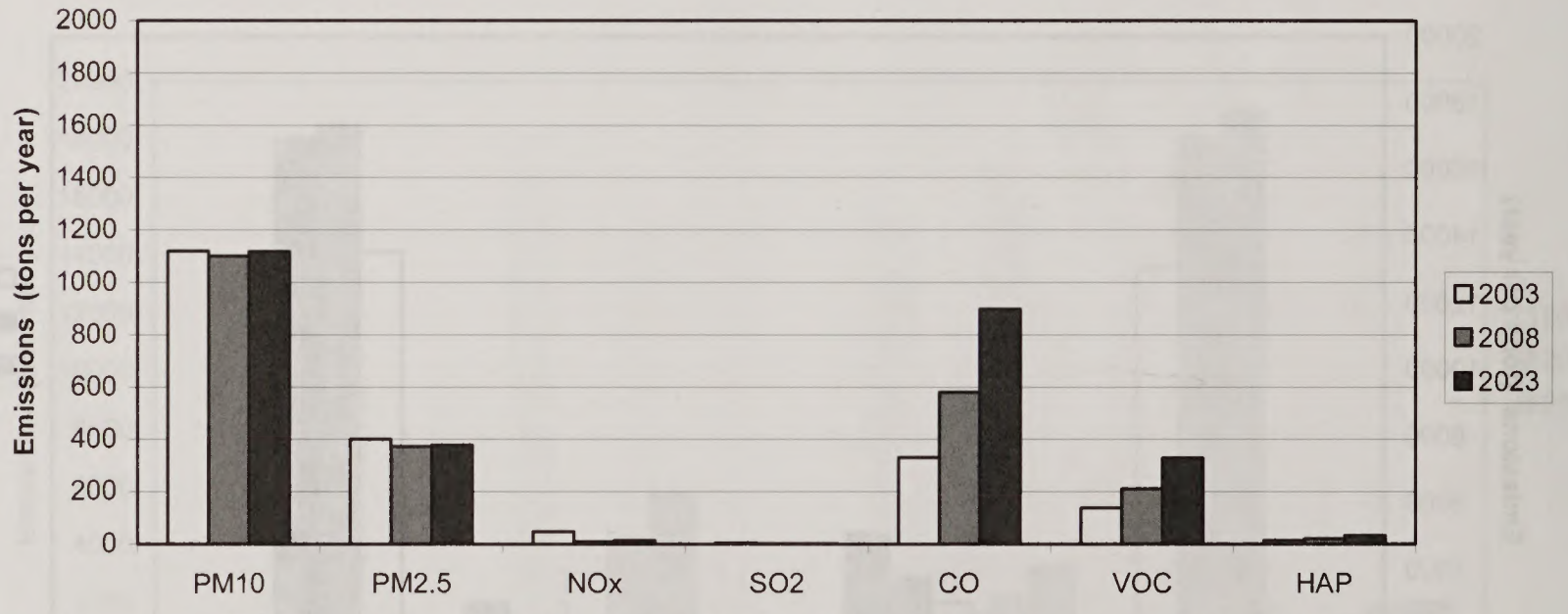


Figure 4-17 Potential Emissions from BLM Non-Oil and Gas Activities – Alternative 1



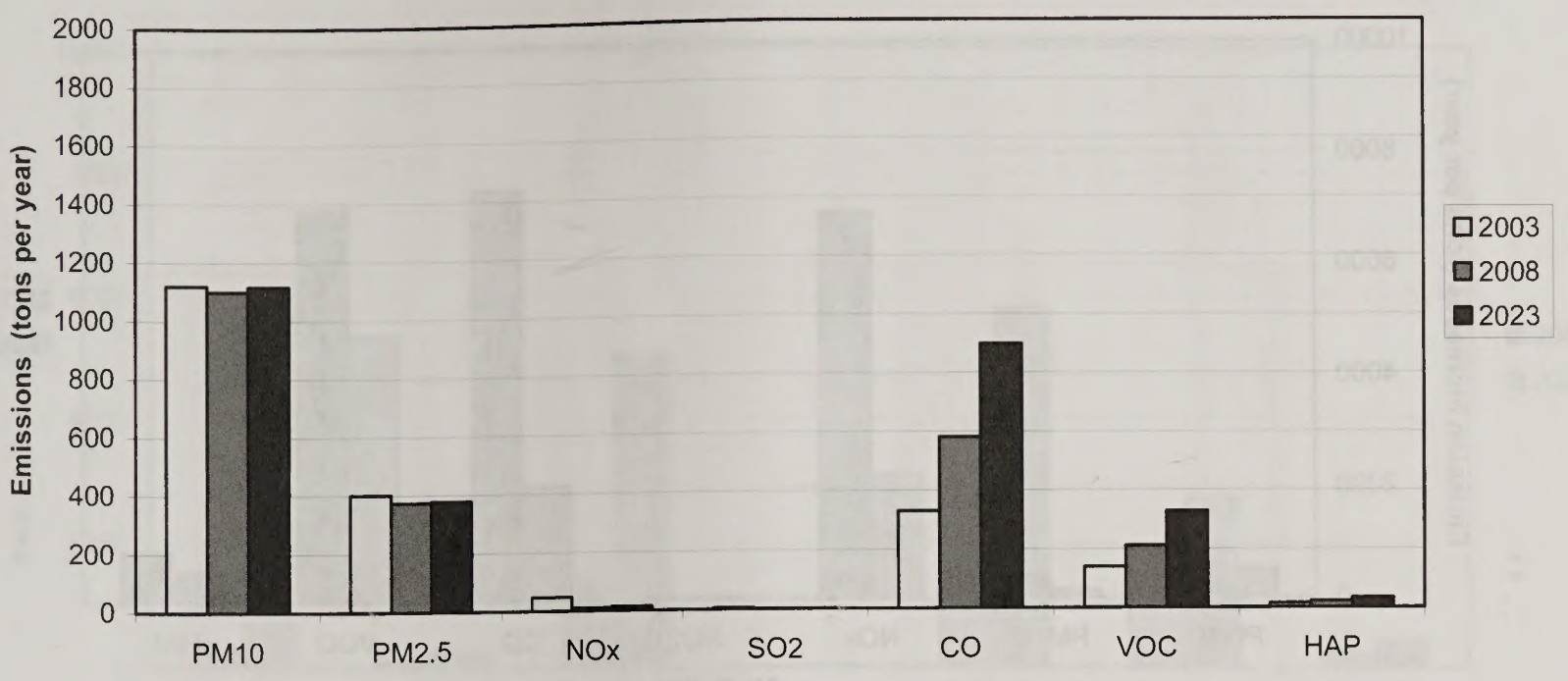
BLM Sources: coal, lands, grazing, OHV, roads, saleable minerals, vegetation, and fire

Figure 4-18 Potential Emissions from BLM Non-Oil and Gas Activities – Alternative 2



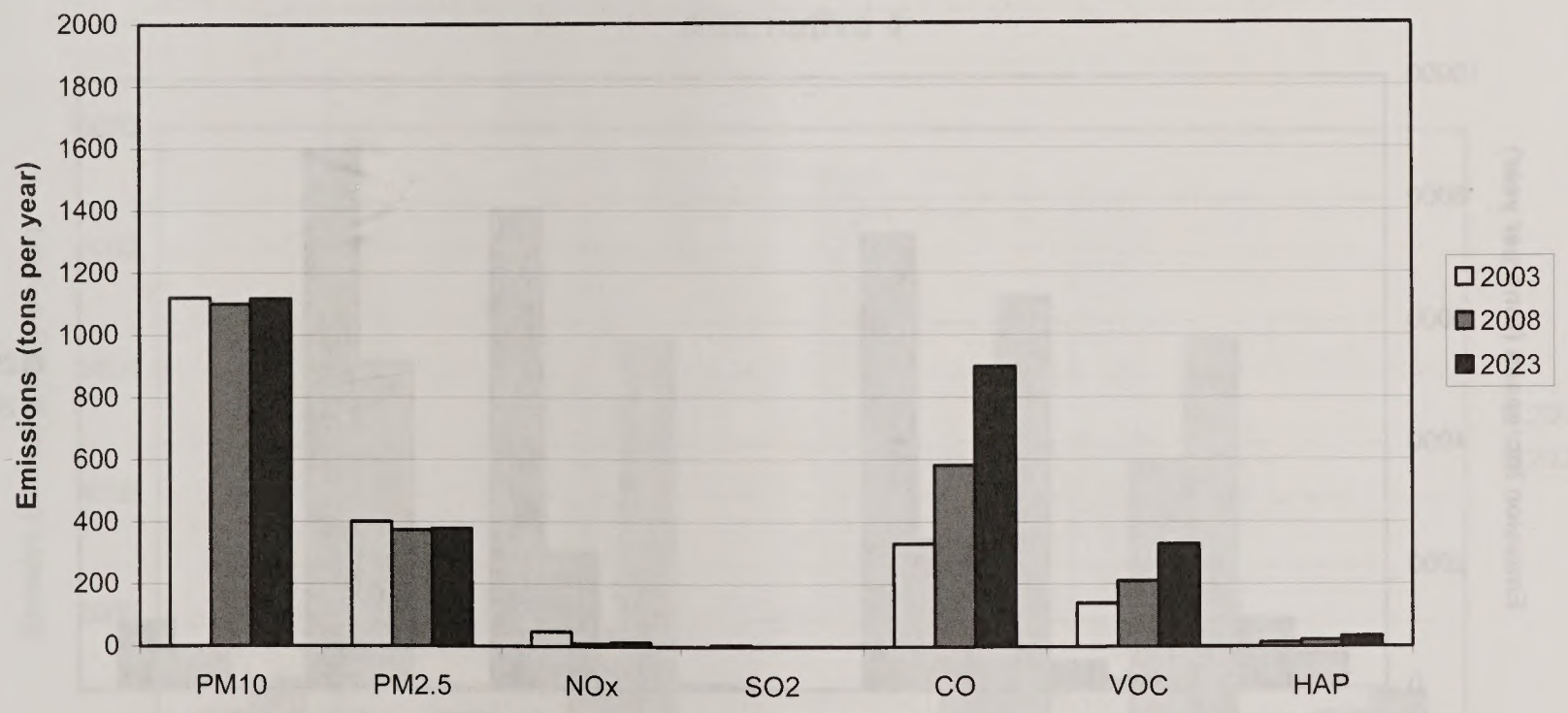
BLM Sources: coal, lands, grazing, OHV, roads, saleable minerals, vegetation, wild horses

Figure 4-19 Potential Emissions from BLM Non-Oil and Gas Activities – Alternative 3



BLM Sources: coal, lands, grazing, OHV, roads, saleable minerals, vegetation, wild horses

Figure 4-20 Potential Emissions from BLM Non-Oil and Gas Activities – Alternative 4



BLM Sources: coal, lands, grazing, OHV, roads, saleable minerals, vegetation, wild horses

Figure 4-21 Increase in Annual Air Emissions from Current Conditions – Alternative 1

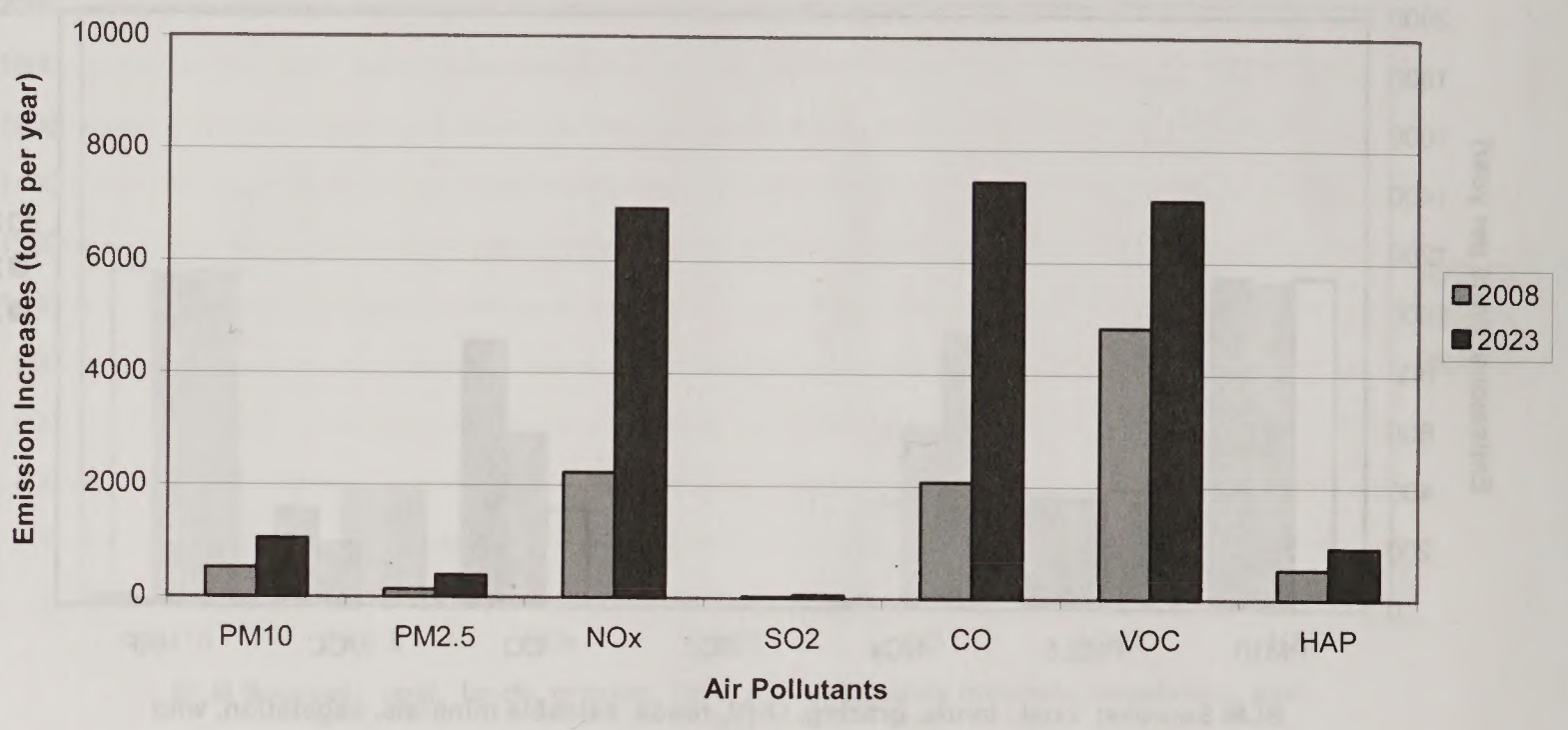


Figure 4-22 Increase in Annual Air Emissions from Current Conditions – Alternative 2

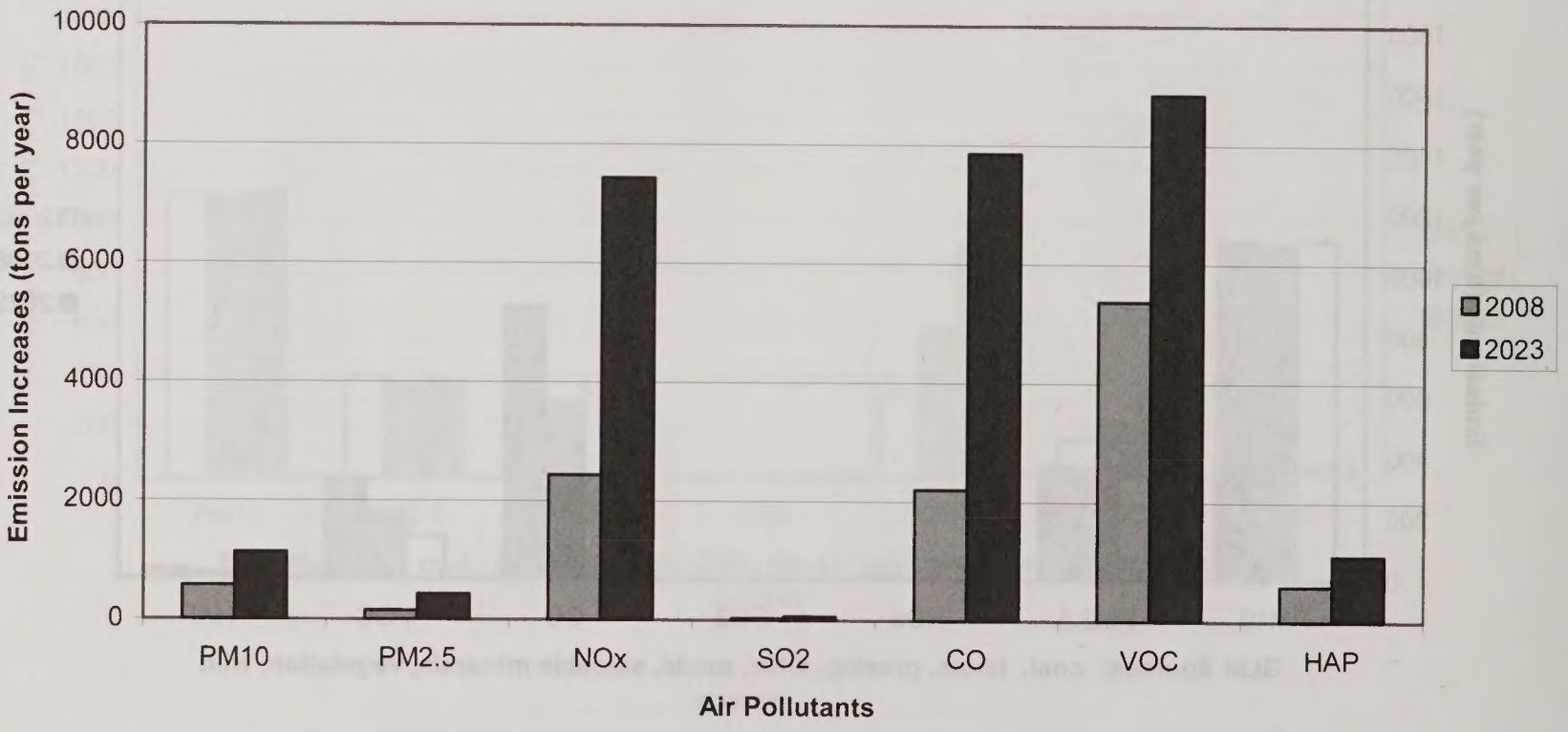


Figure 4-23 Increase in Annual Air Emissions from Current Conditions – Alternative 3

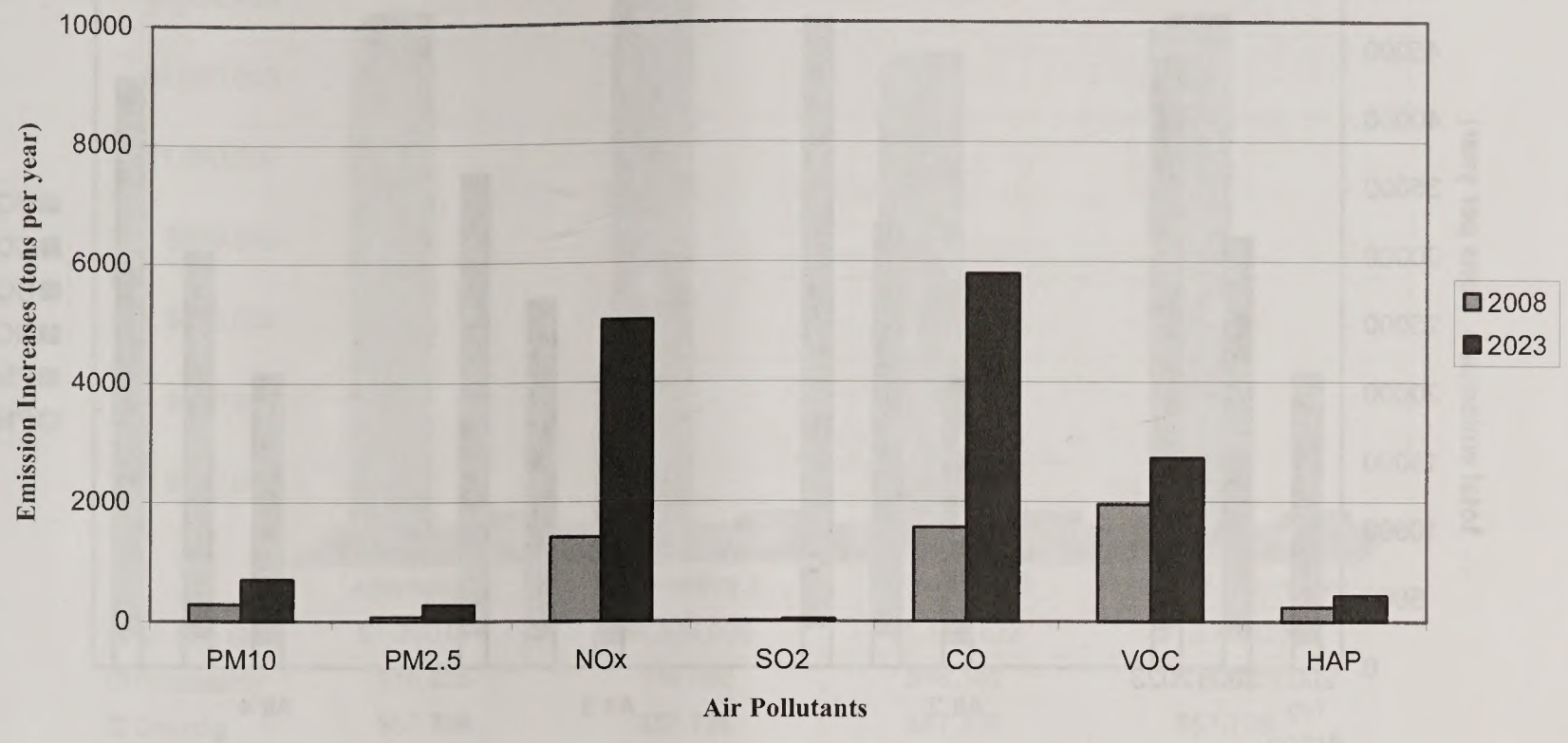


Figure 4-24 Increase in Annual Air Emissions from Current Conditions – Alternative 4

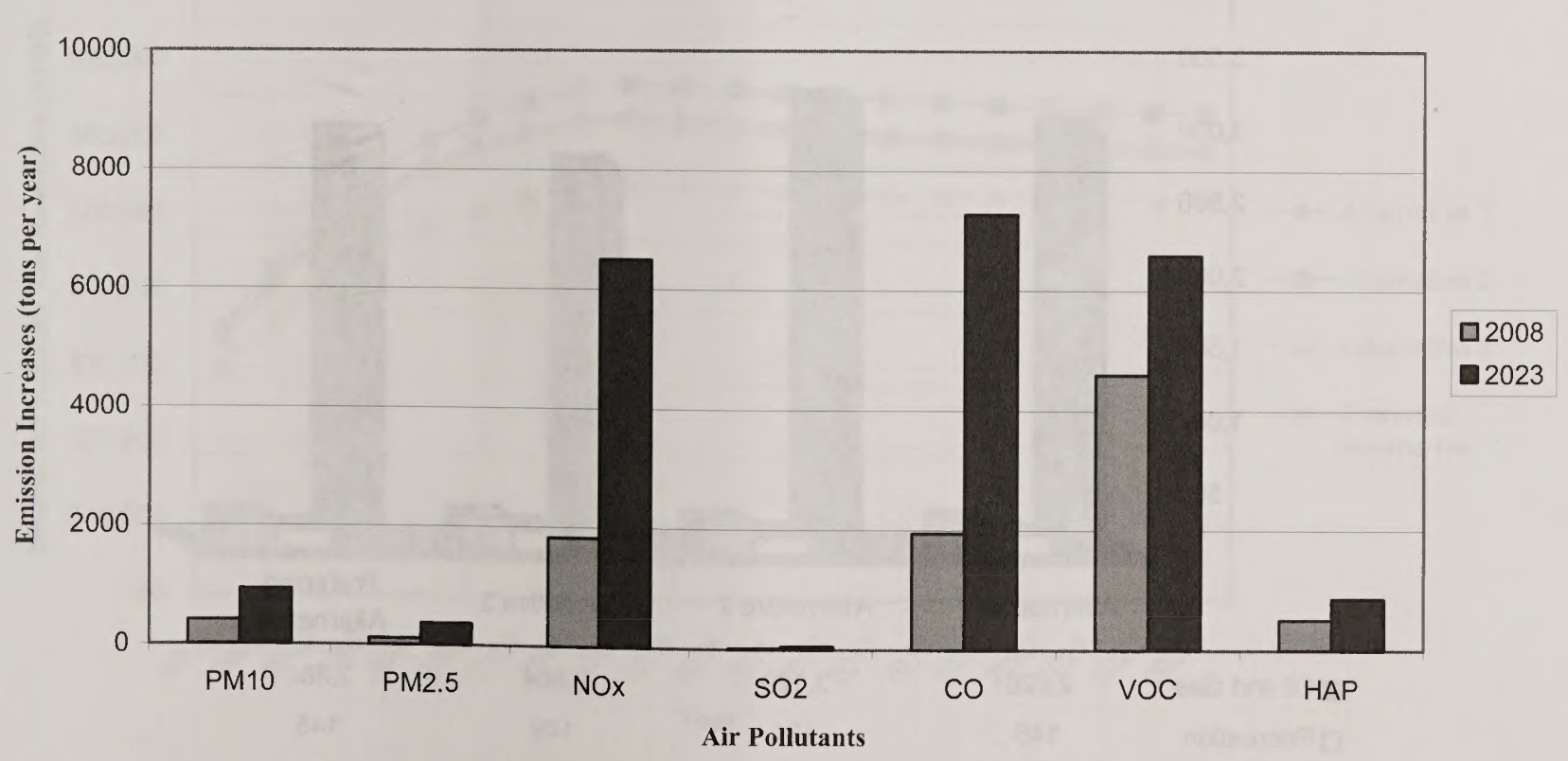


Figure 4-25 Summary of Total Emmissions

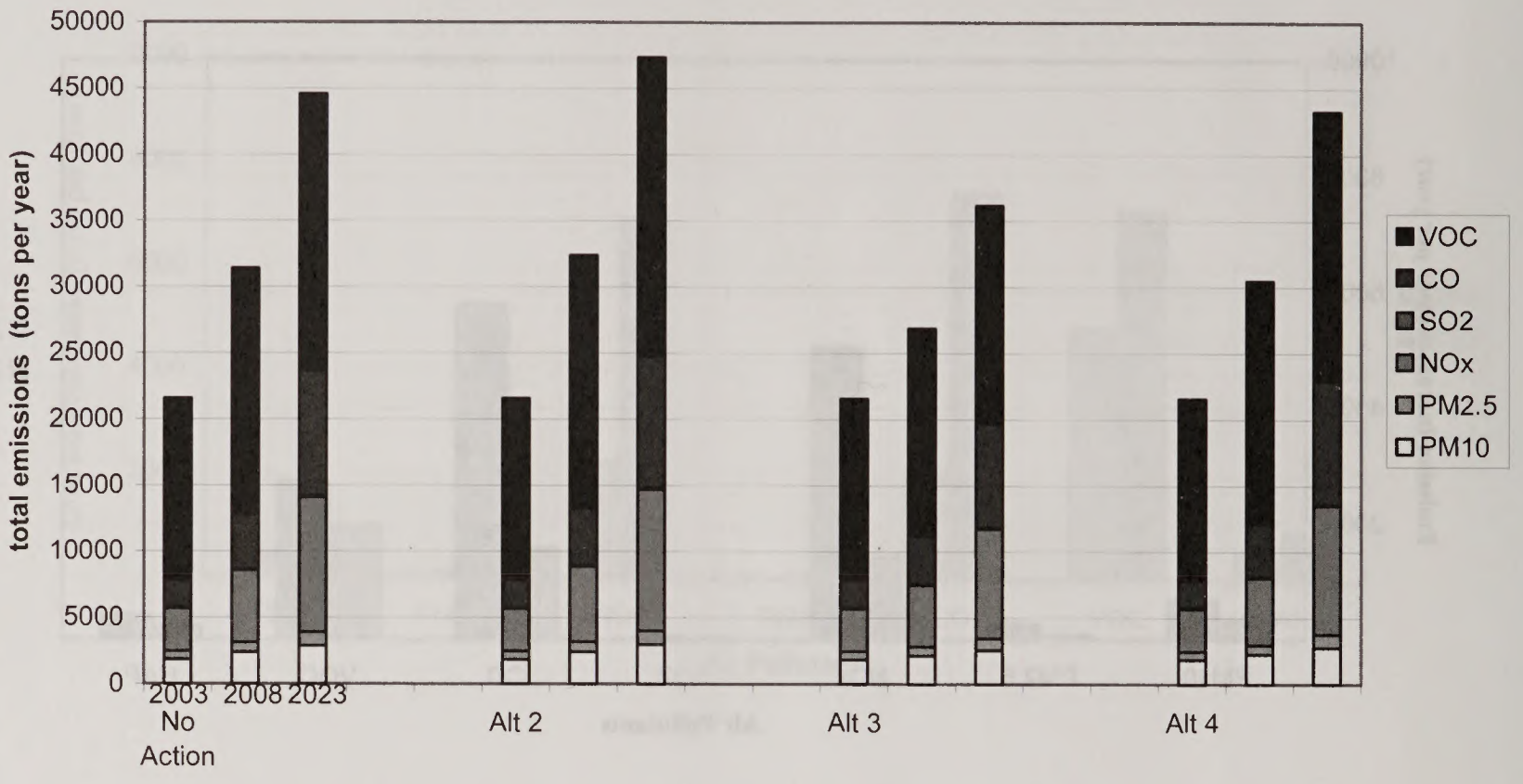
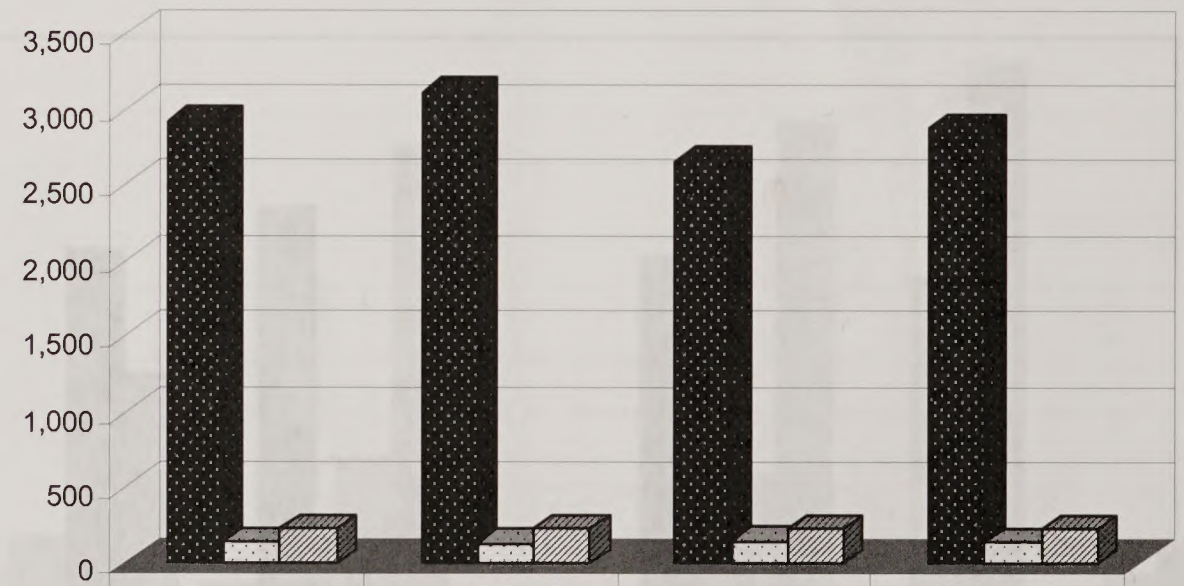
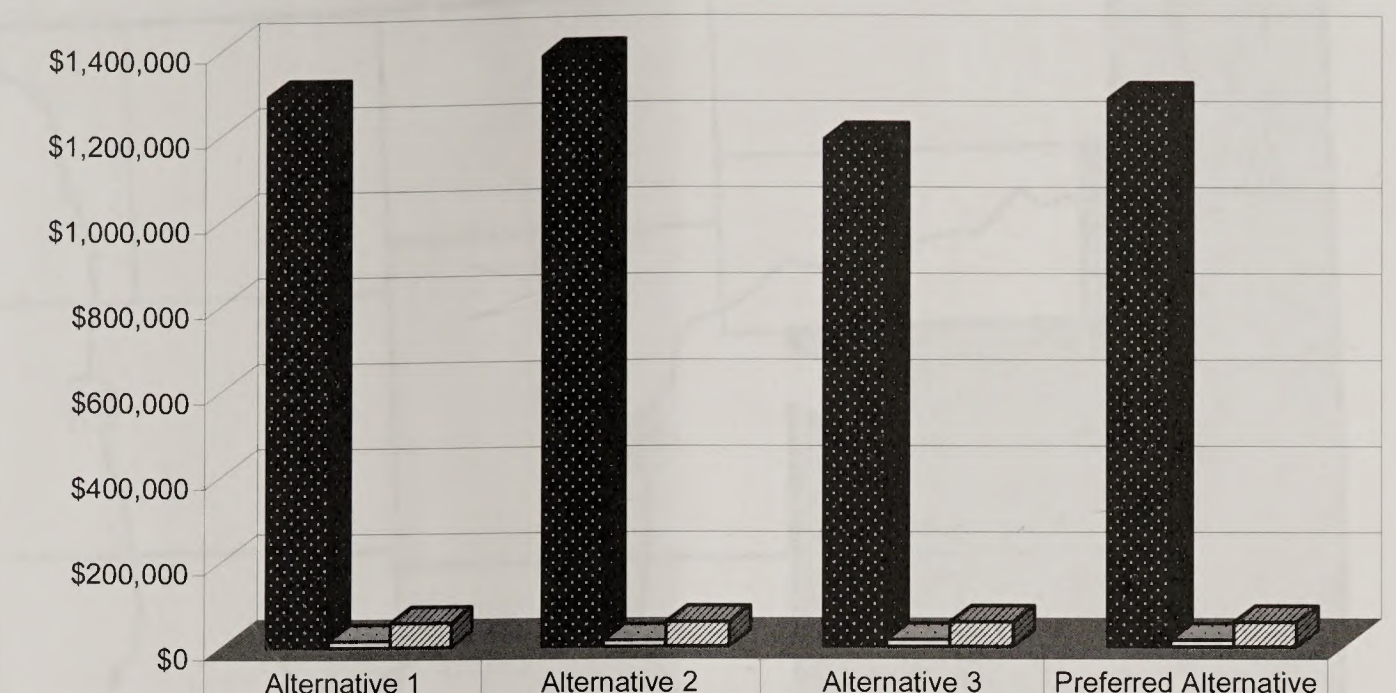


Figure 4-26 Average Annual Employment by Alternative



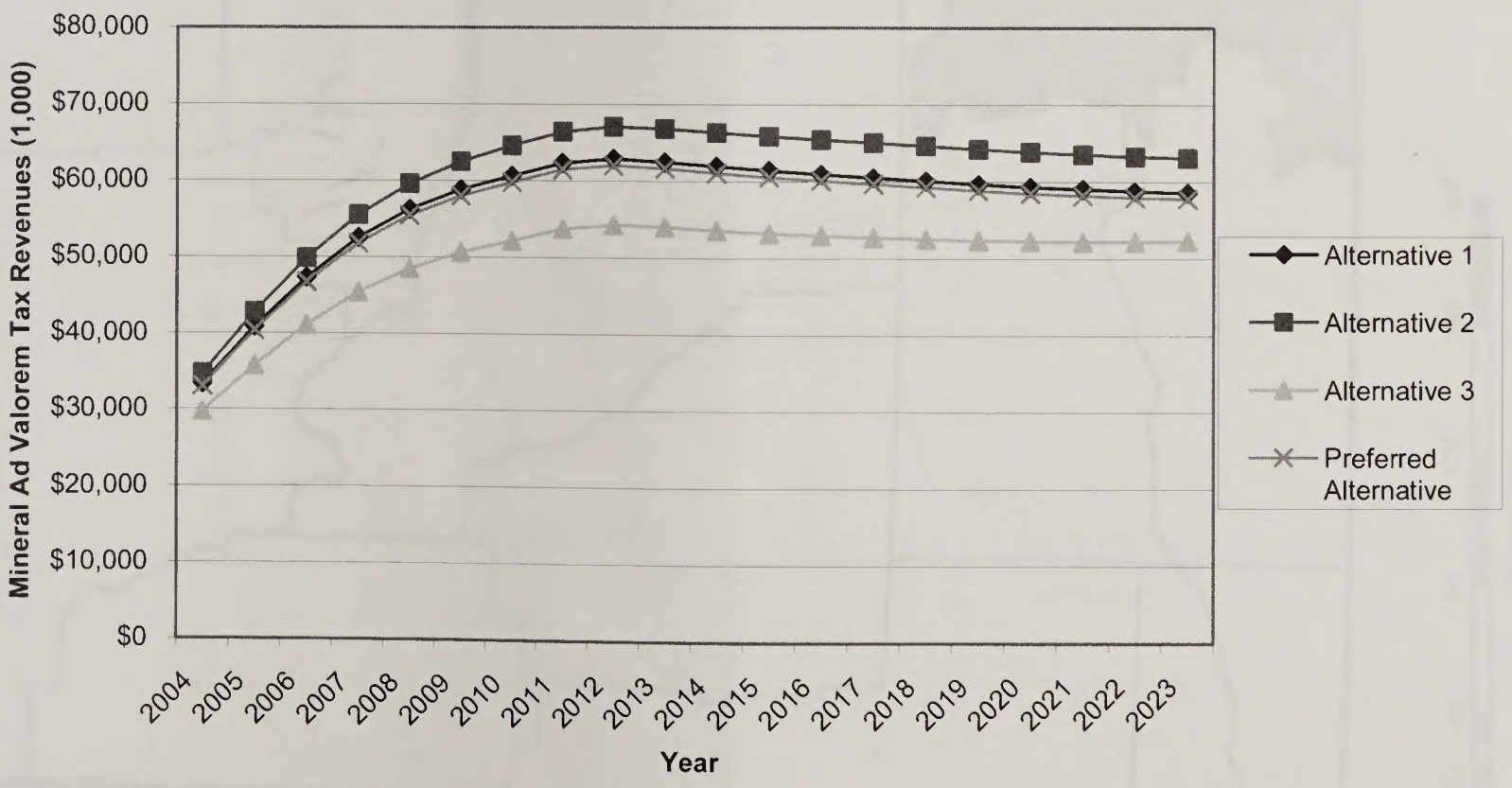
	Alternative 1	Alternative 2	Alternative 3	Preferred Alternative
Oil and Gas	2,926	3,120	2,664	2,884
Recreation	145	134	149	145
Grazing	231	231	231	231

Figure 4-27 Total Earnings by Alternative

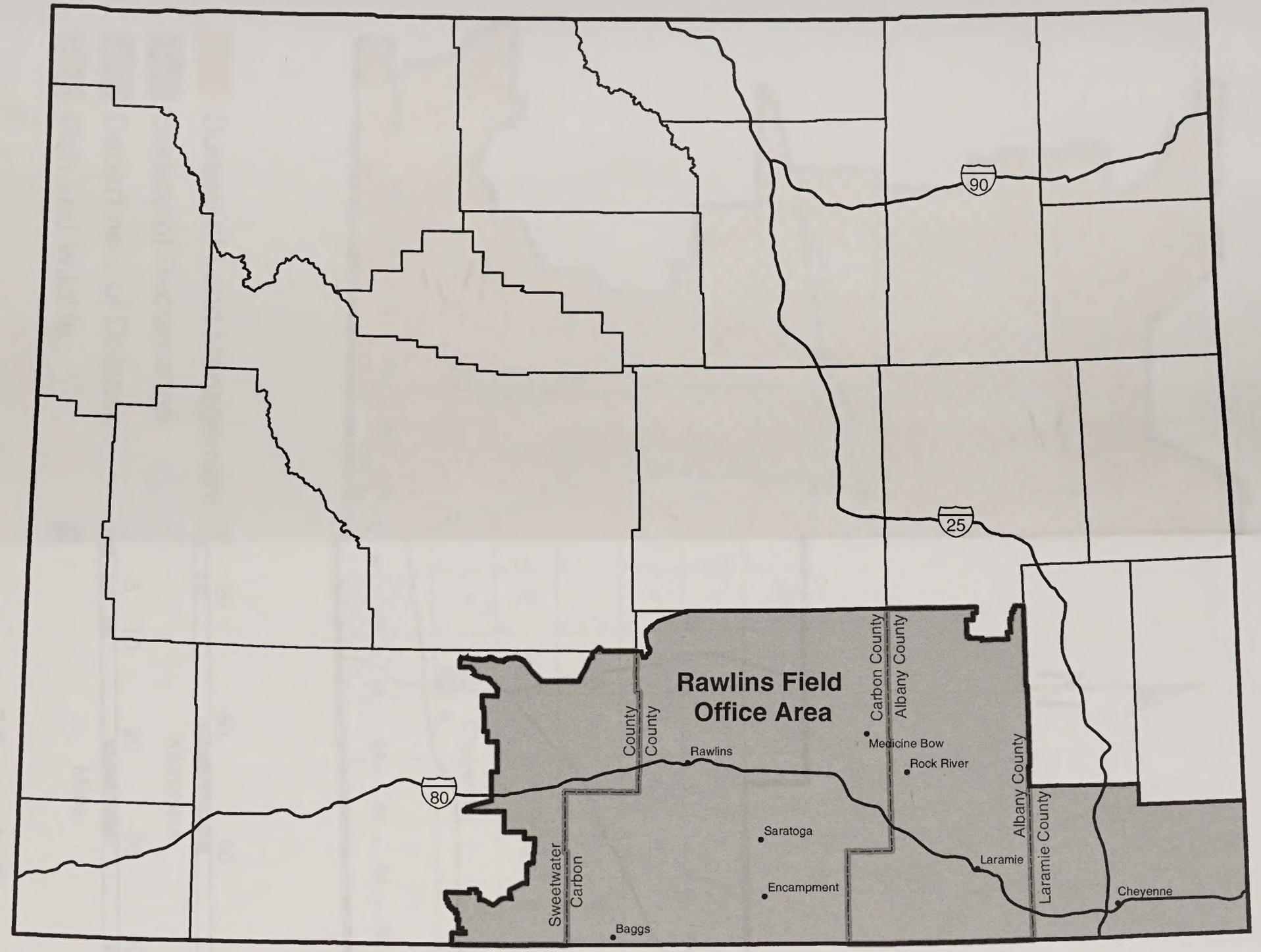


	Alternative 1	Alternative 2	Alternative 3	Preferred Alternative
Oil and Gas	$1,290,970	$1,376,005	$1,178,522	$1,272,825
Recreation	$15,825	$14,868	$16,142	$15,825
Grazing	$57,736	$57,736	$57,736	$57,736

Figure 4-28 Estimated Ad Valorem Tax Revenues by Alternative







0 20 40 80 120 160 200

Kilometers

0 10 20 40 60 80 100

Miles

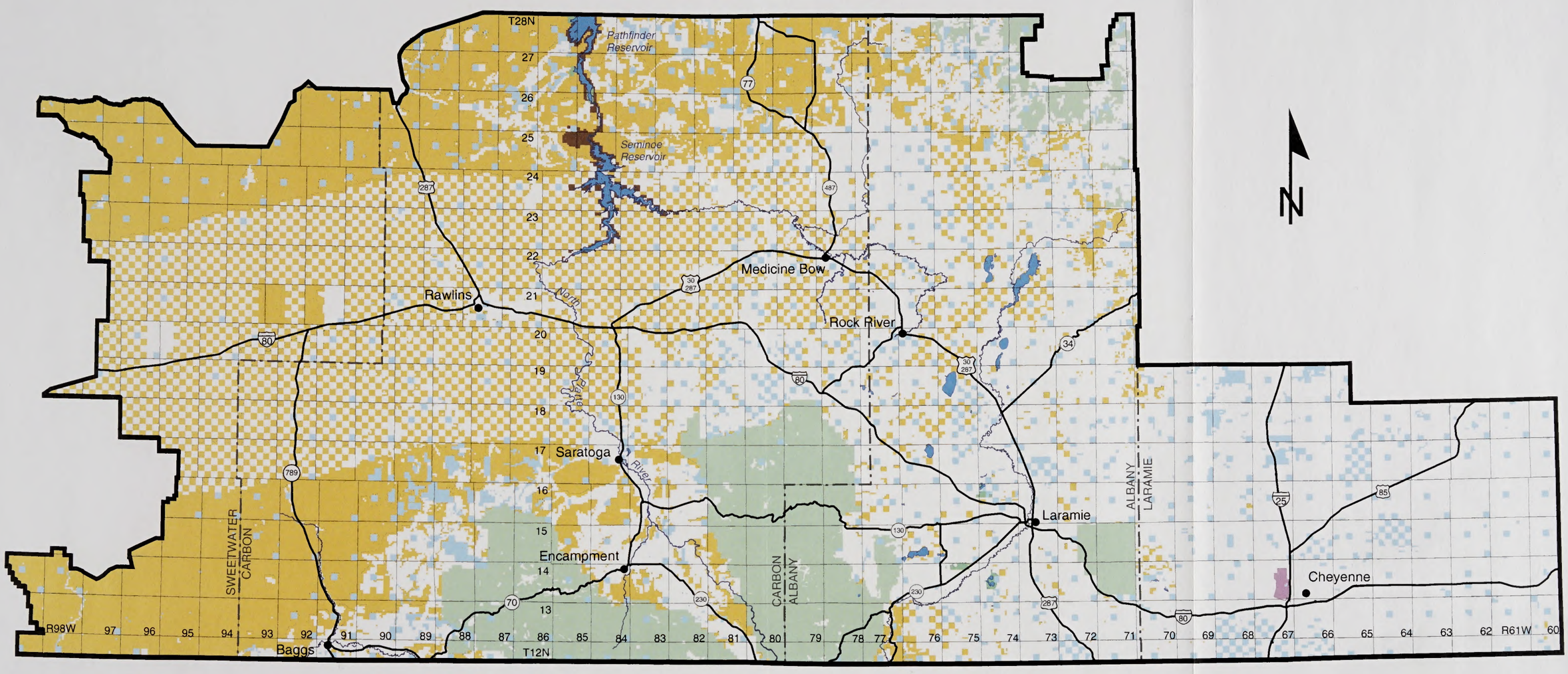
N

Map 1-1
Overview

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM



Map 1-1
Overview



N

- Bureau of Land Management
- Bureau of Reclamation
- Department of Defense
- Fish and Wildlife
- Forest Service
- Private
- State
- Water

0 10 20 40 60 80 100
Kilometers

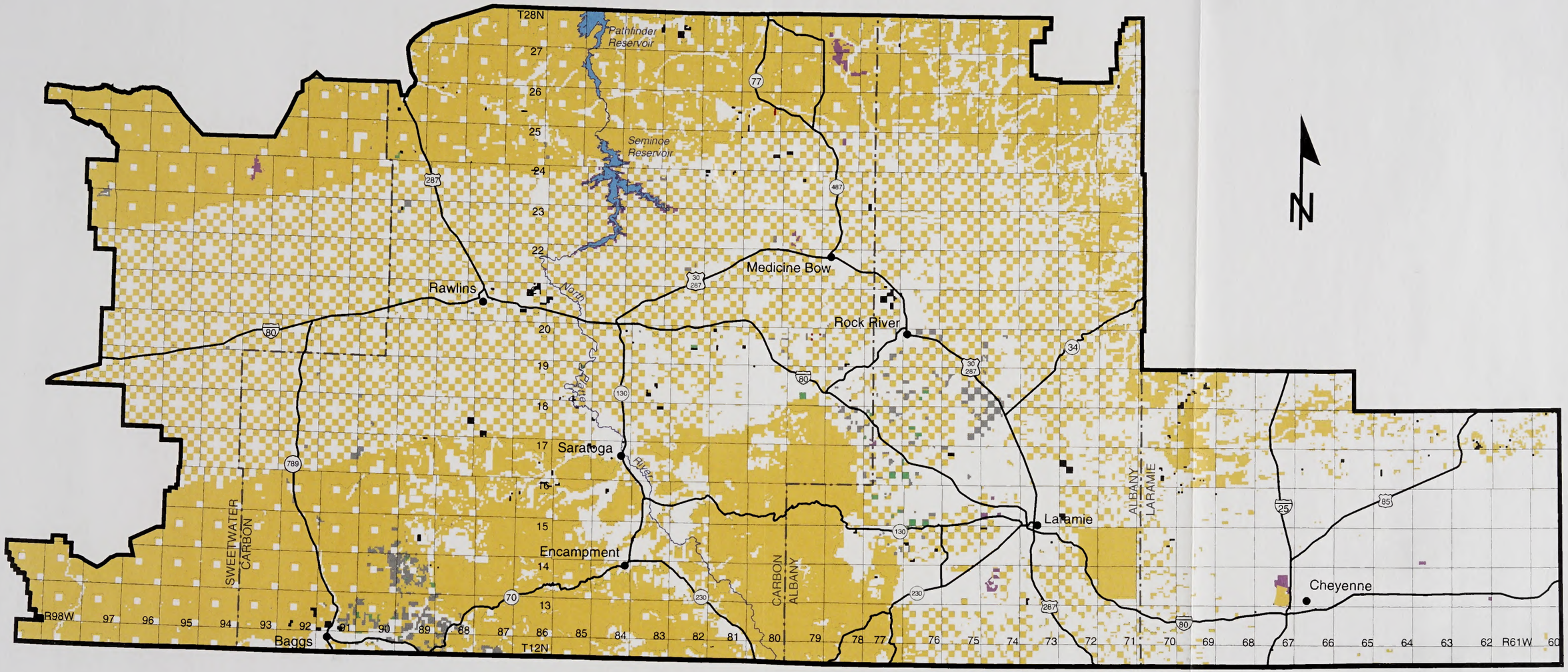
0 5 10 20 30 40 50
Miles

Map 1-2

Surface Administration

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





All
Coal Only
Oil,Gas Only
Oil,Gas,Coal Only
Oil, Gas, and Other
Other
No Federal Mineral Rights

0 10 20 40 60 80 100
Kilometers

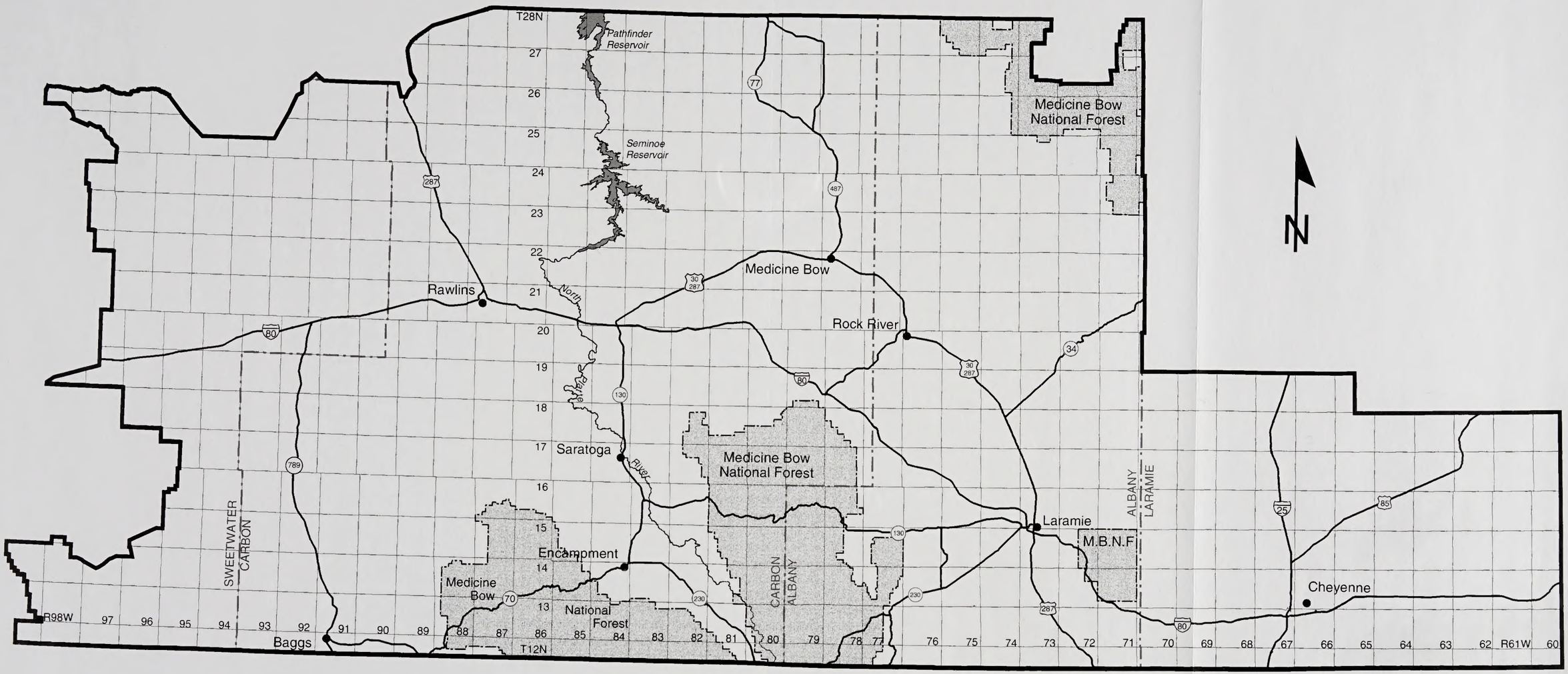
0 5 10 20 30 40 50
Miles

Map 1-3

Sub-Surface Administration

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





N

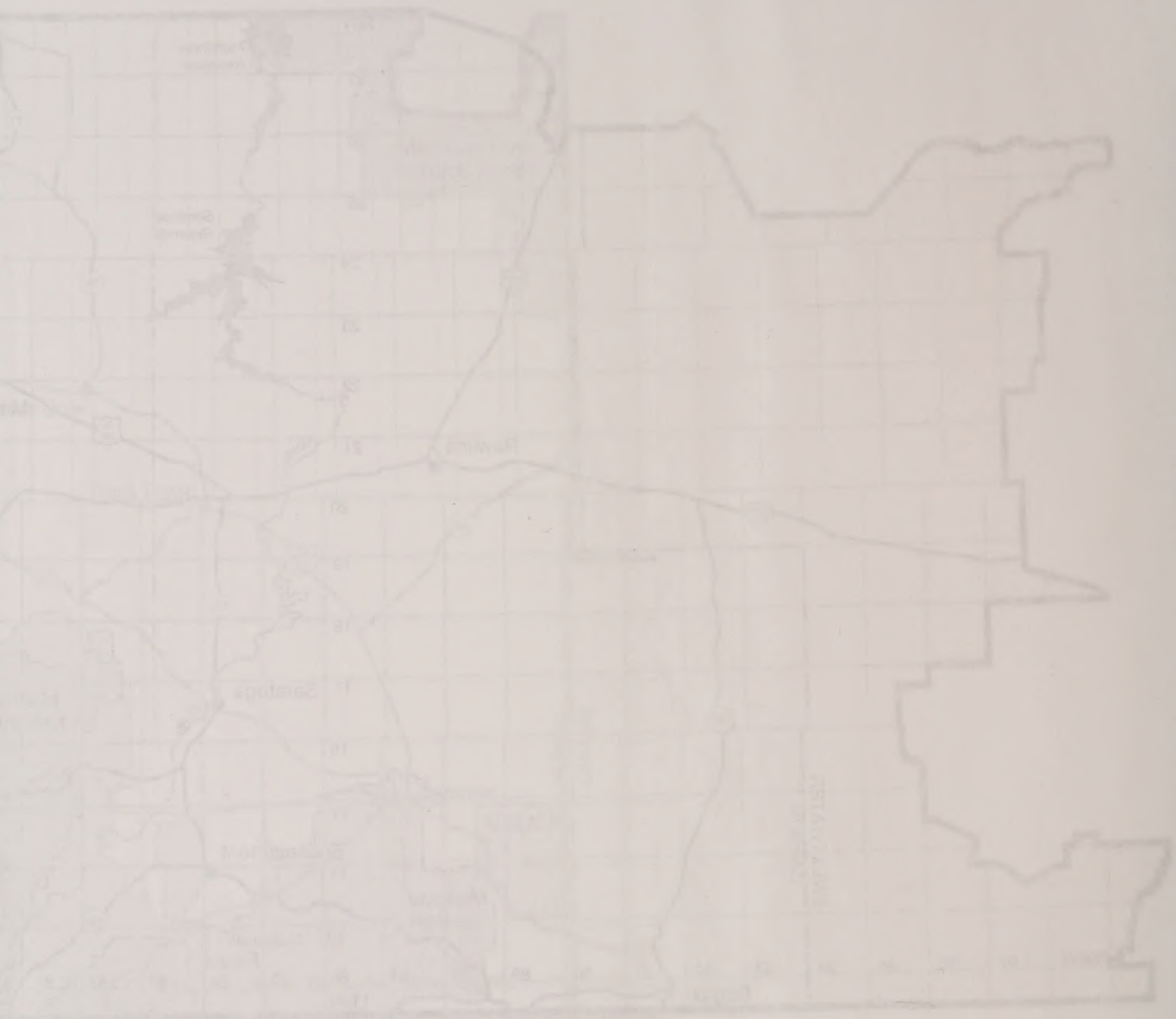
0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 1-4

Rawlins RMPPA

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





▲ Communities at Risk*

Use of Wildland Fire

Checkerboard and Inter-mixed Public and Private Lands

Wildland Urban Interface

* This map does not show all the potential communities at risk only those presently identified by the State of Wyoming.

0 10 20 40 60 80 100
Kilometers

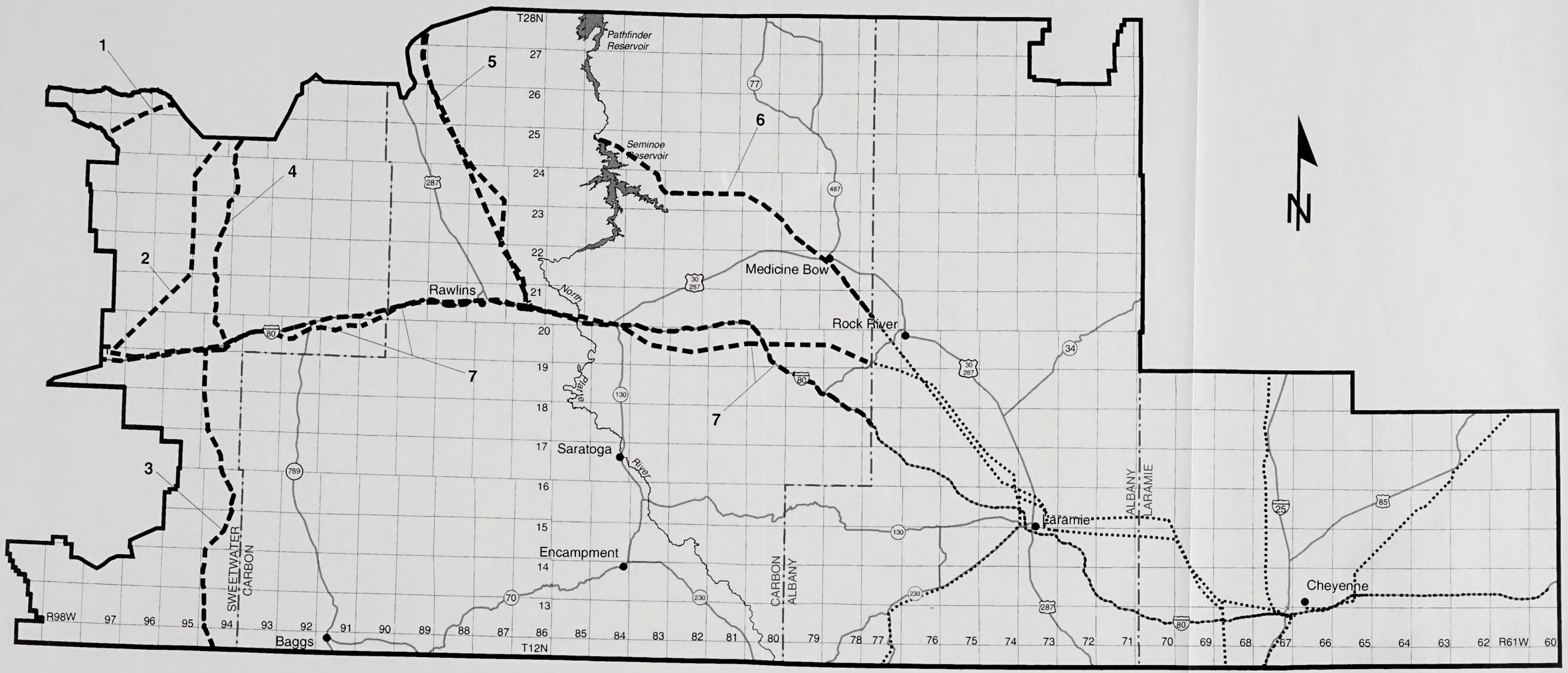
0 5 10 20 30 40 50
Miles

Map 2-1

Fire Management

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





- Designated Right-of-Way Corridors
  - 1 Exxon/Frontier Natural Gas Pipelines
  - 2 Spence-Bairoil-Jim Bridger 230 kV Transmission Line
  - 3 CIG Natural Gas Pipelines
  - 4 Lost Creek Natural Gas Pipeline
  - 5 Sinclair Natural Gas Pipelines
  - 6 WAPA Powerline
  - 7 I-80 Corridor
- Other Utility/Transportation Corridors

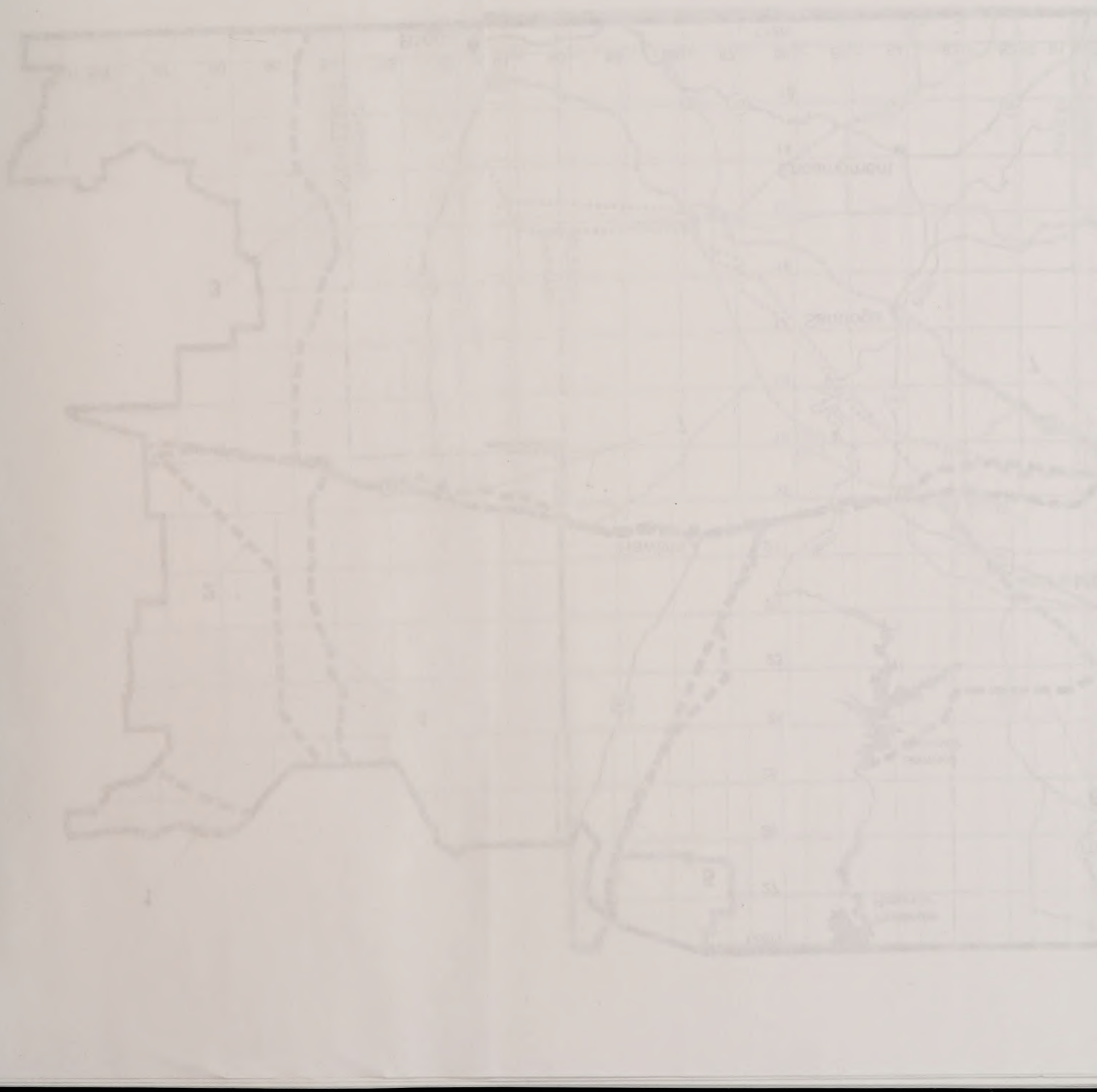
0 10 20 40 60 80 100
Kilometers

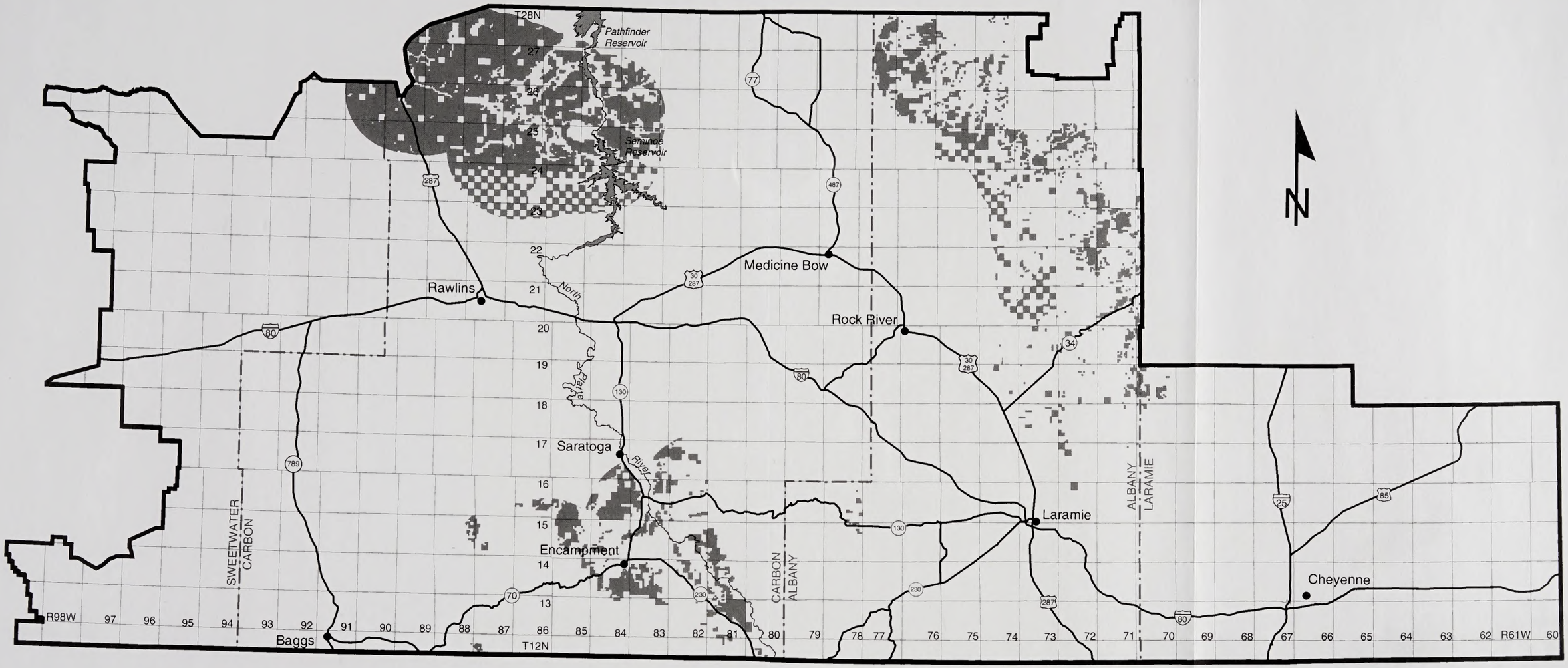
0 5 10 20 30 40 50
Miles

Map 2-2

Designated Right-of-Way Corridors

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Avoidance of Domestic Sheep Grazing

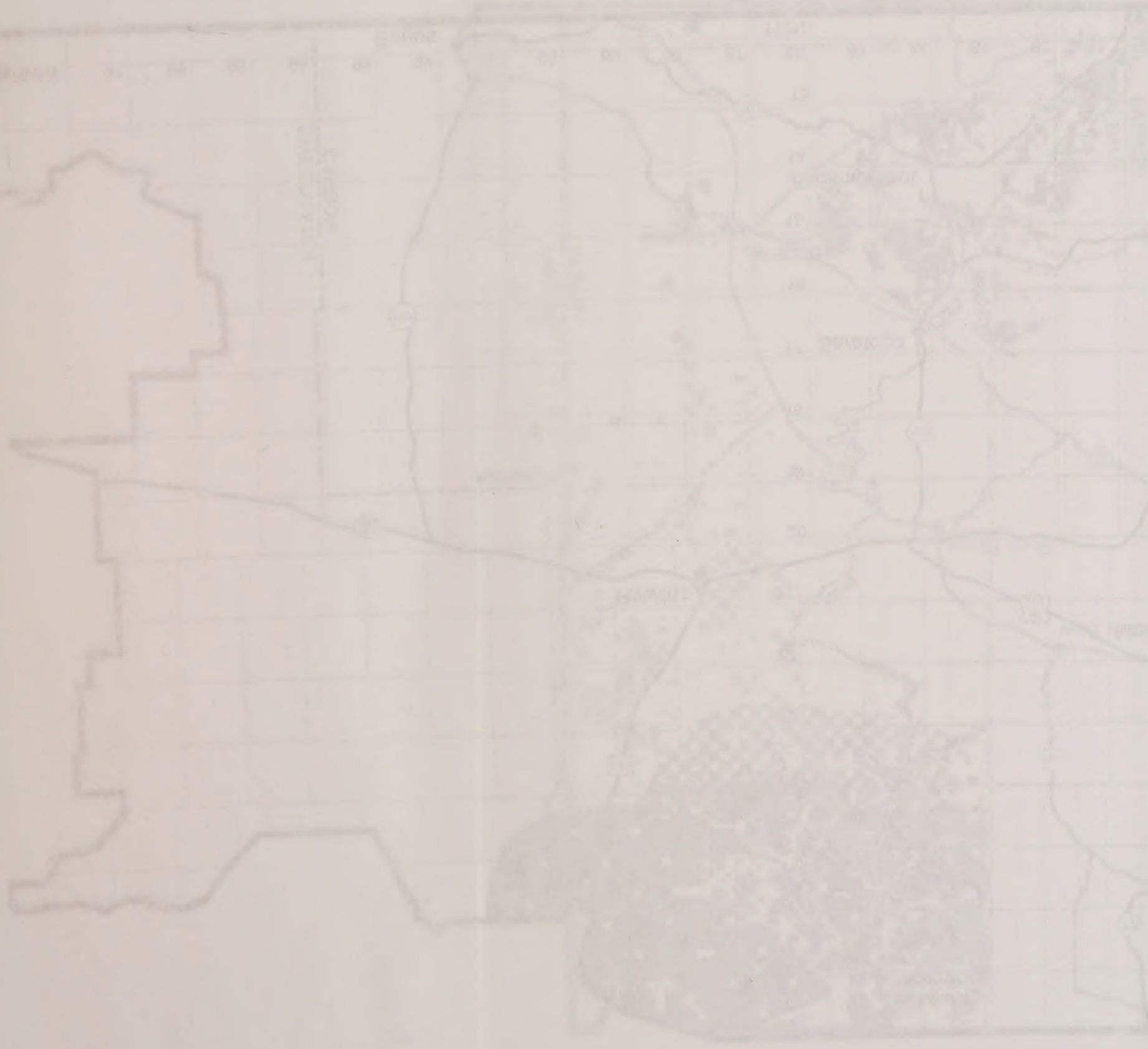
0 10 20 40 60 80 100
Kilometers

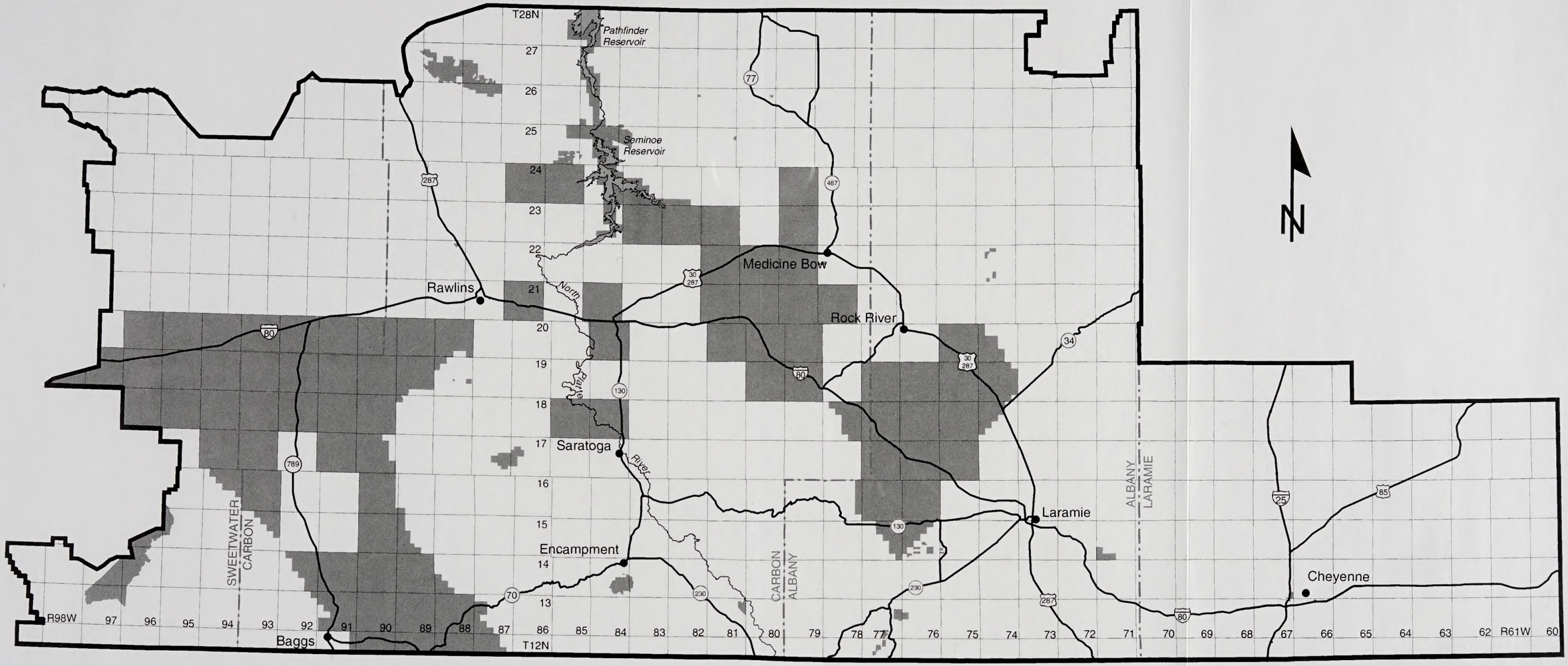
0 5 10 20 30 40 50
Miles

Map 2-3

Domestic Sheep Avoidance Areas

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Withdrawn from Locatable Mineral Entry

0 10 20 40 60 80 100
Kilometers

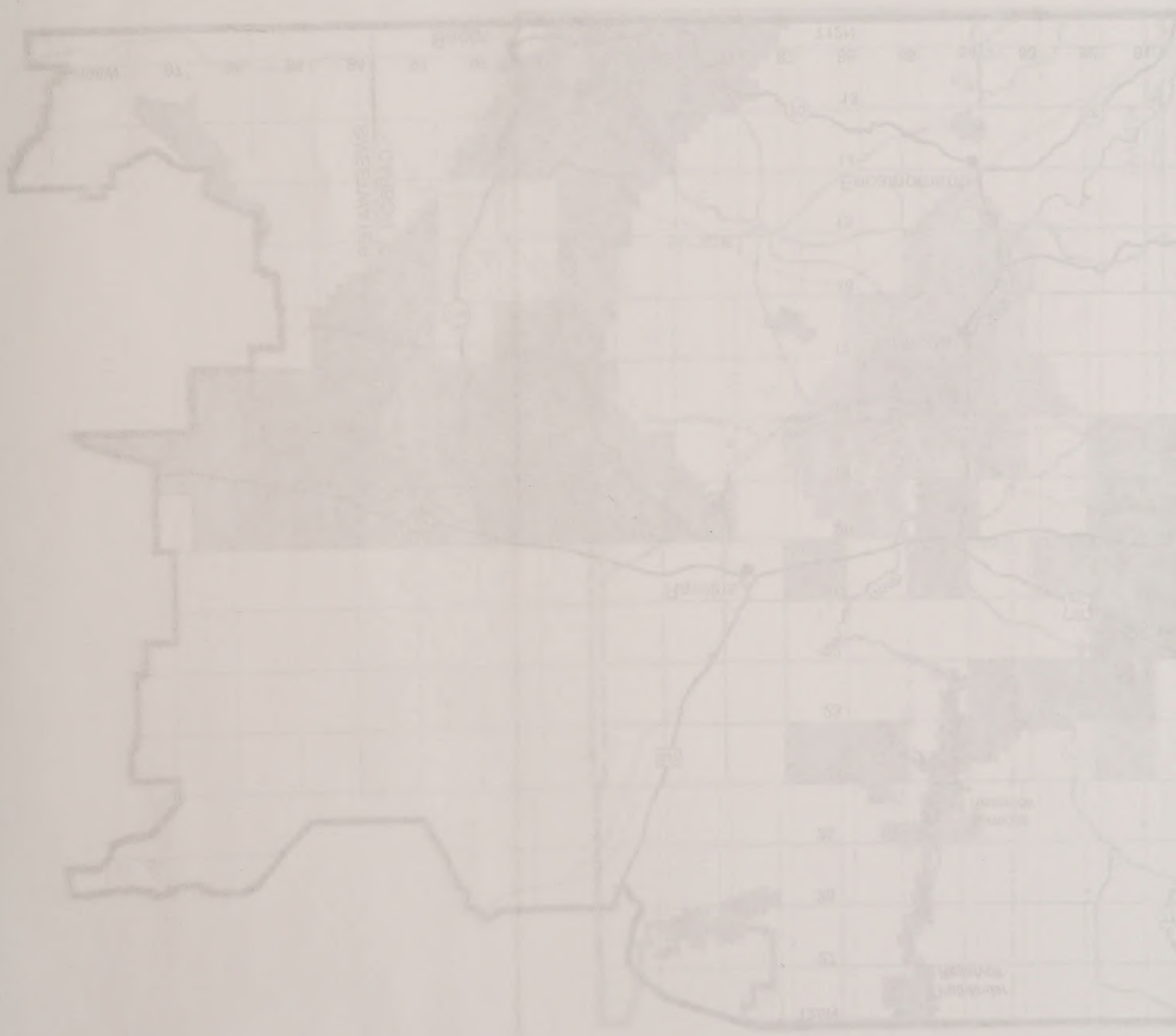
0 5 10 20 30 40 50
Miles

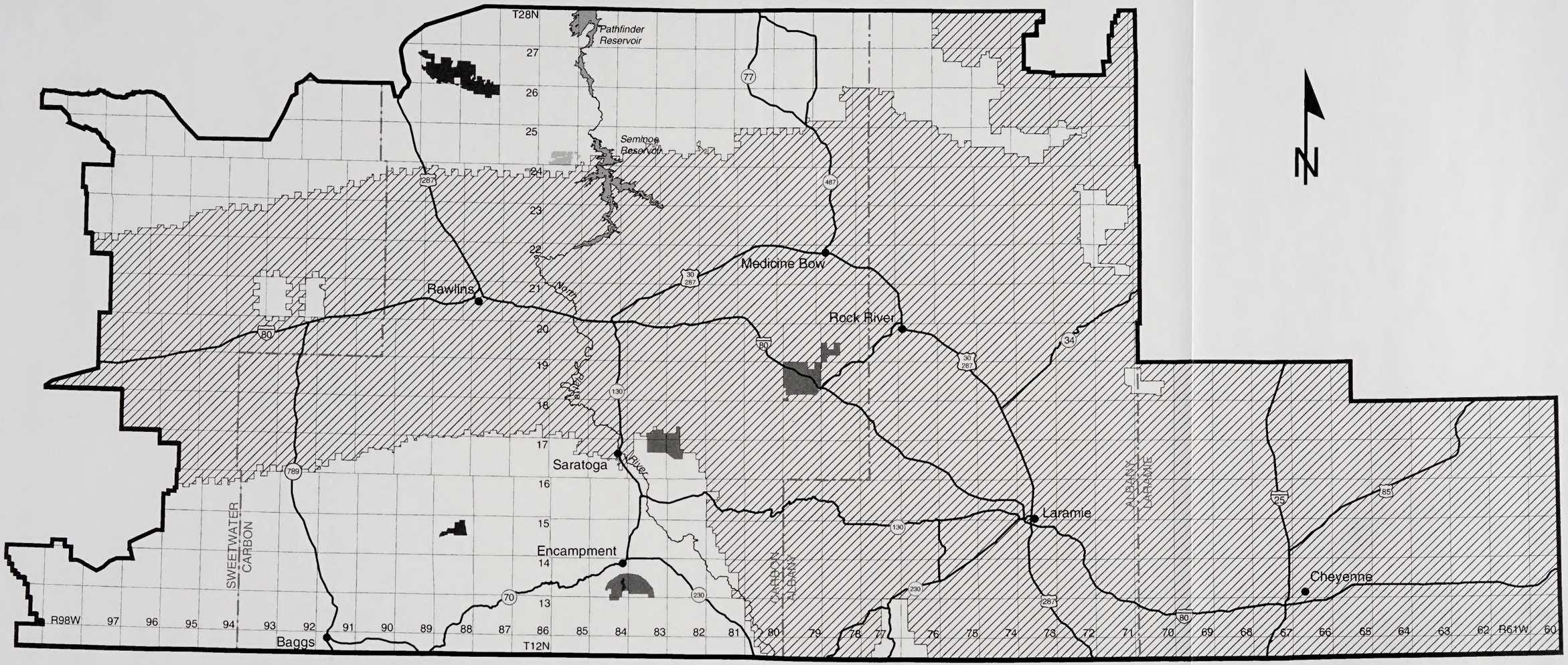
Map 2-4

Locatable Mineral Withdrawals

Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Open

Closed

Limited - Seasonal Closure

Limited - Existing Roads and Vehicle Routes

Limited - Designated Roads and Trails/Existing Roads and Vehicle Routes

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

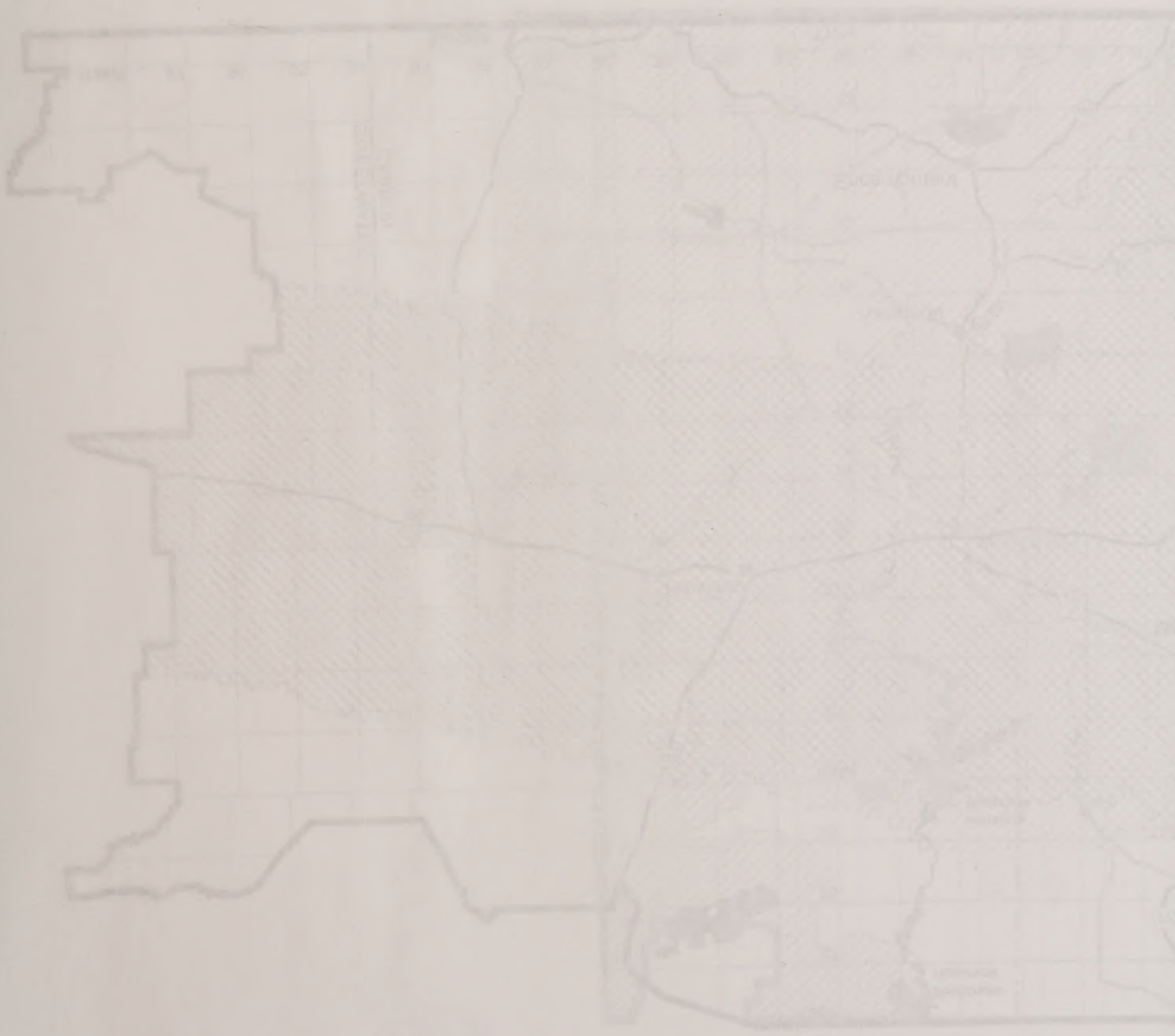
Miles

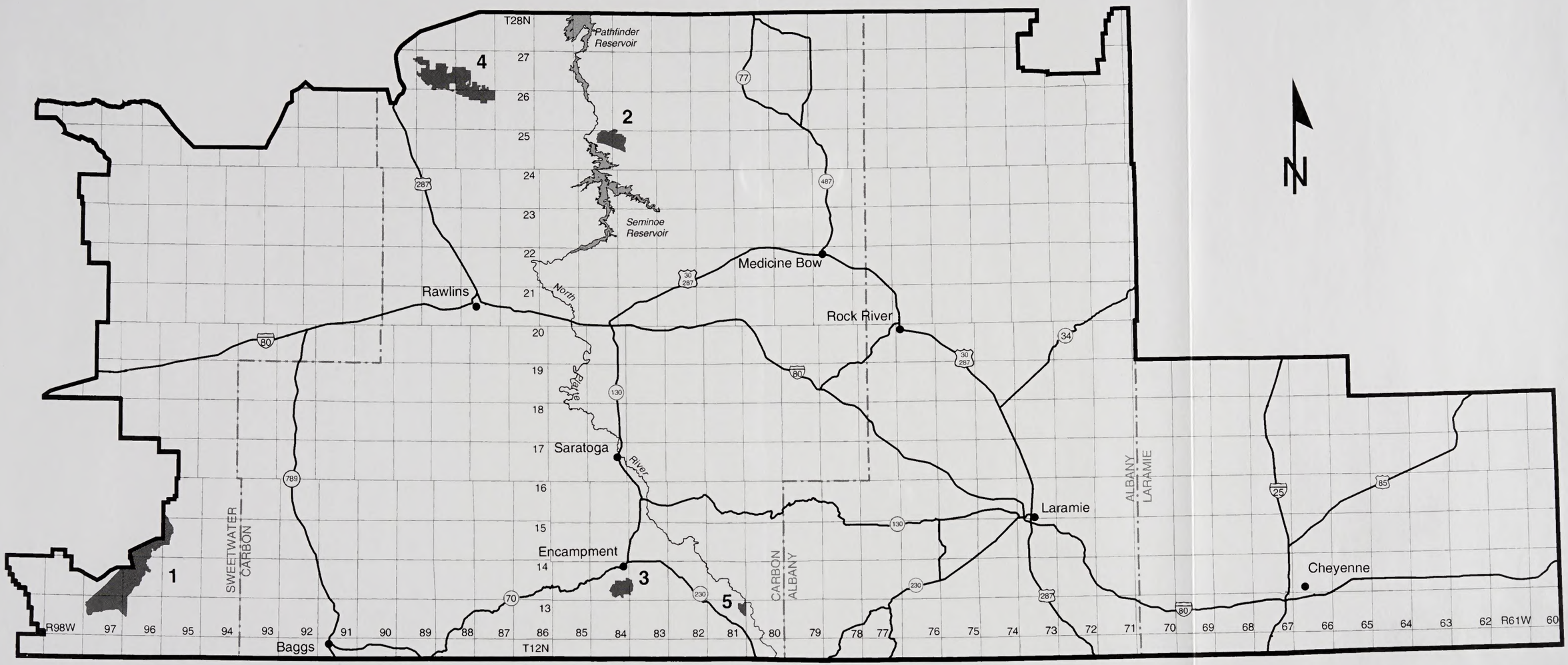
Map 2-5

OHV Designations

Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Wilderness Study Areas

1 Adobe Town

2 Bennett Mountain

3 Encampment River Canyon

4 Ferris Mountain

5 Prospect Mountain

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

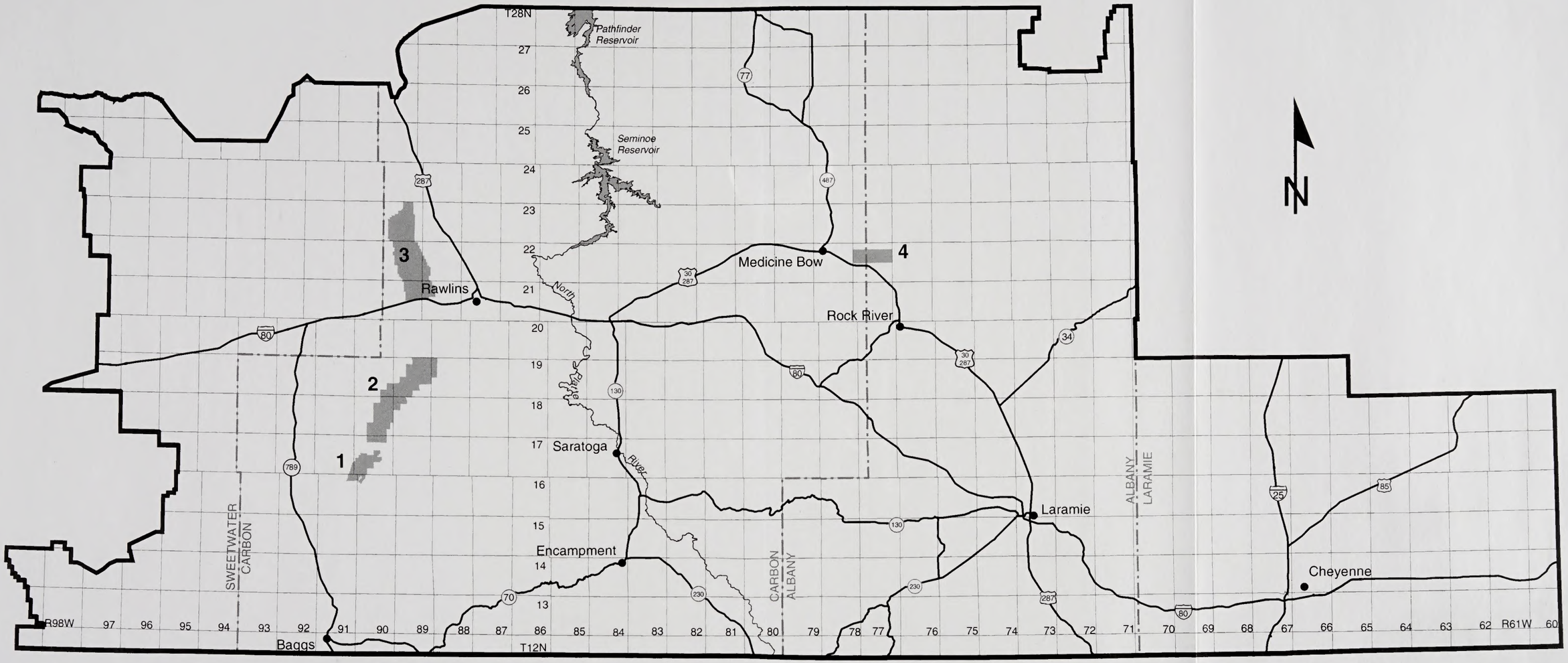
Miles

Map 2-6

Wilderness Study Areas

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Areas of Critical Environmental Concern

1 Sand Hills
2 Jep Canyon
3 Shamrock Hills
4 Como Bluffs

0 10 20 40 60 80 100
Kilometers

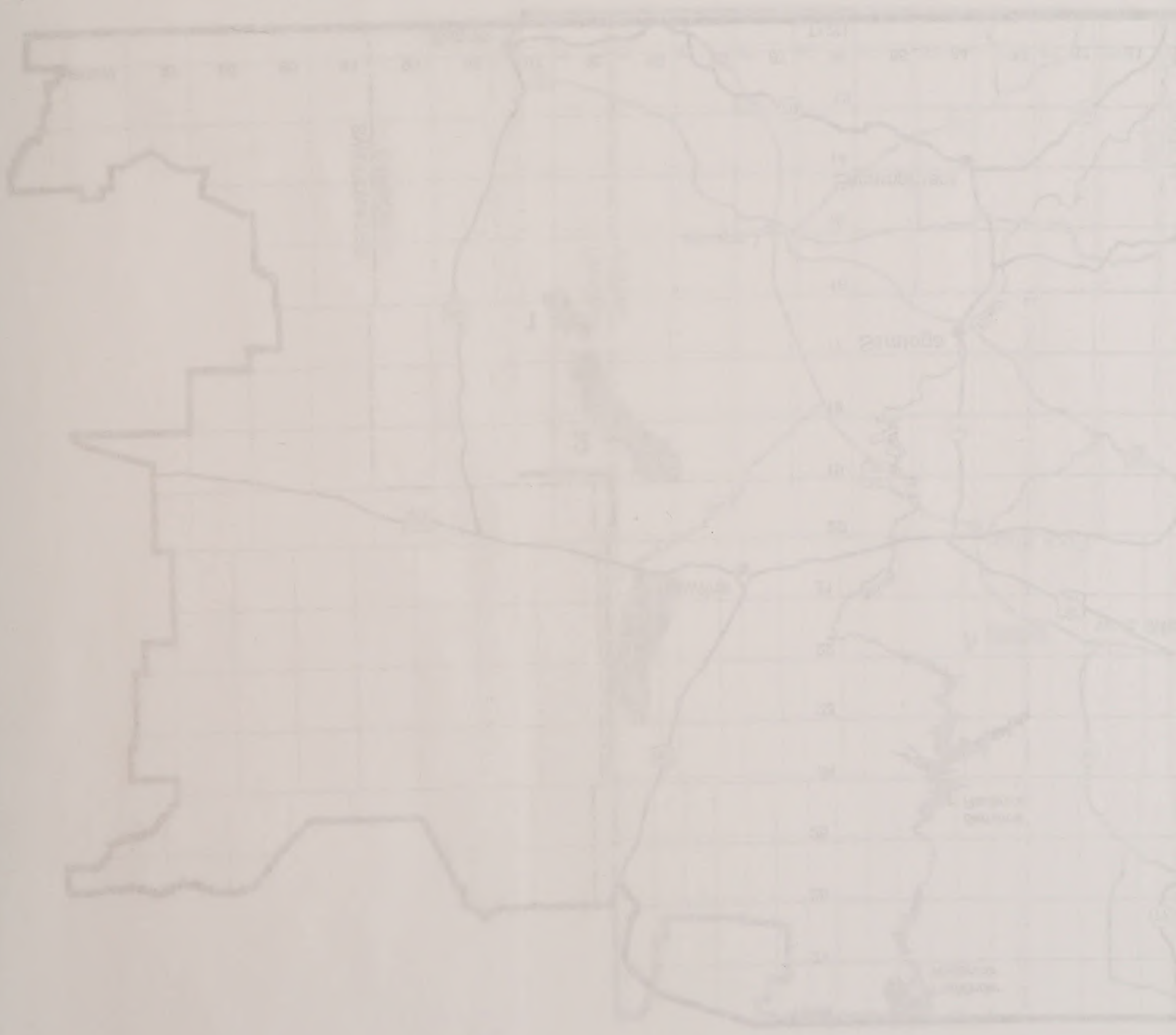
0 5 10 20 30 40 50
Miles

Map 2-7

Areas of Critical Environmental Concern

Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM



Areas of Critical Environmental Concern

1 Chain Lakes
2 Red Rim-Daley
3 Sand Hills
4 Upper Muddy Creek Watershed/Grizzly
5 High Savery Dam
6 Stratton Sagebrush Steppe Research Area
7 Blowout Penstemon
8 Shirley Mountain Bat Cave
9 Como Bluff
10 Laramie Plains Lakes
11 Laramie Peak

▲ White Tailed Prairie Dog ACEC

A Sweetwater
B Dad
C Shamrock Hills
D Pathfinder
E Bolton Ranch
F Seminoe
G Saratoga
H Shirley Basin / Medicine Bow

Historic Trails ACEC

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM

0 10 20 40 60 80 100
Kilometers

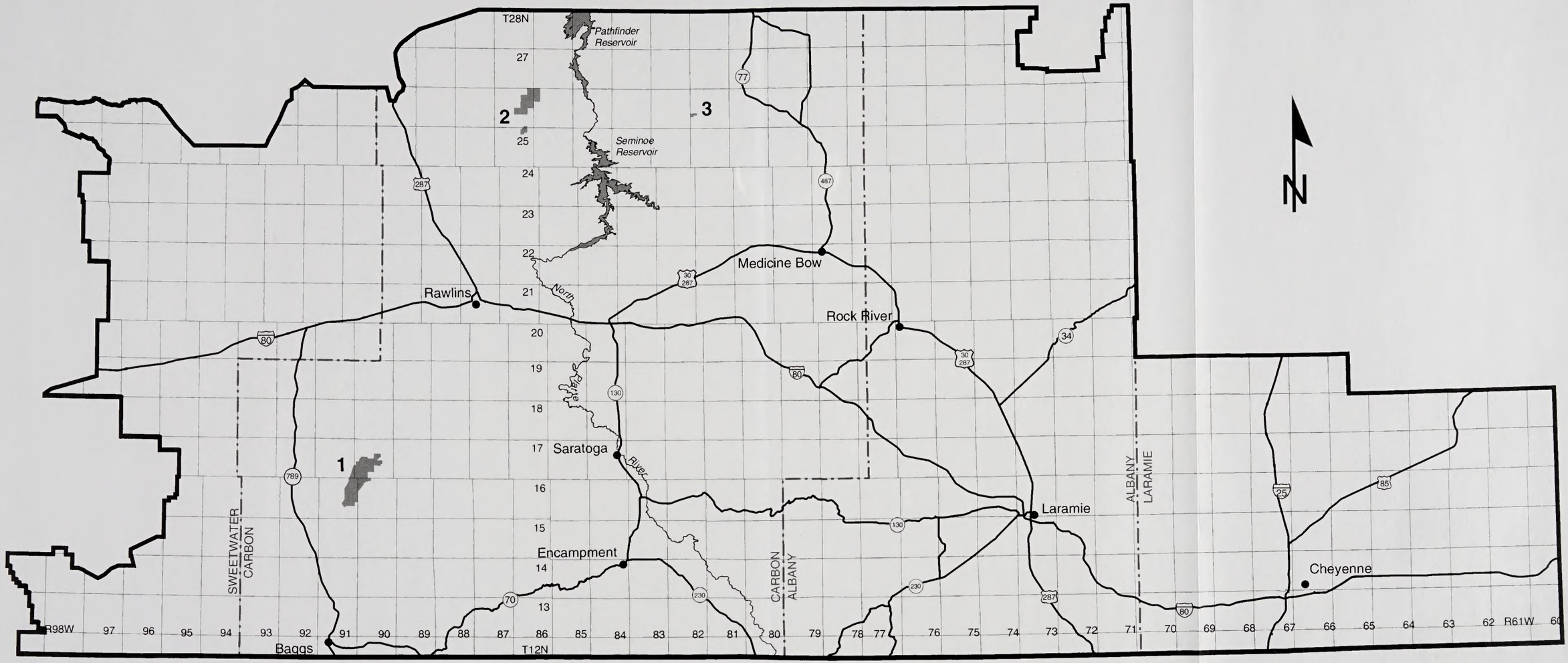
0 5 10 20 30 40 50
Miles

Map 2-8

Areas of Critical Environmental Concern

Alternative 3





Areas of Critical Environmental Concern

1 Sand Hills

2 Blowout Penstemon

3 Shirley Mountain Bat Cave

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

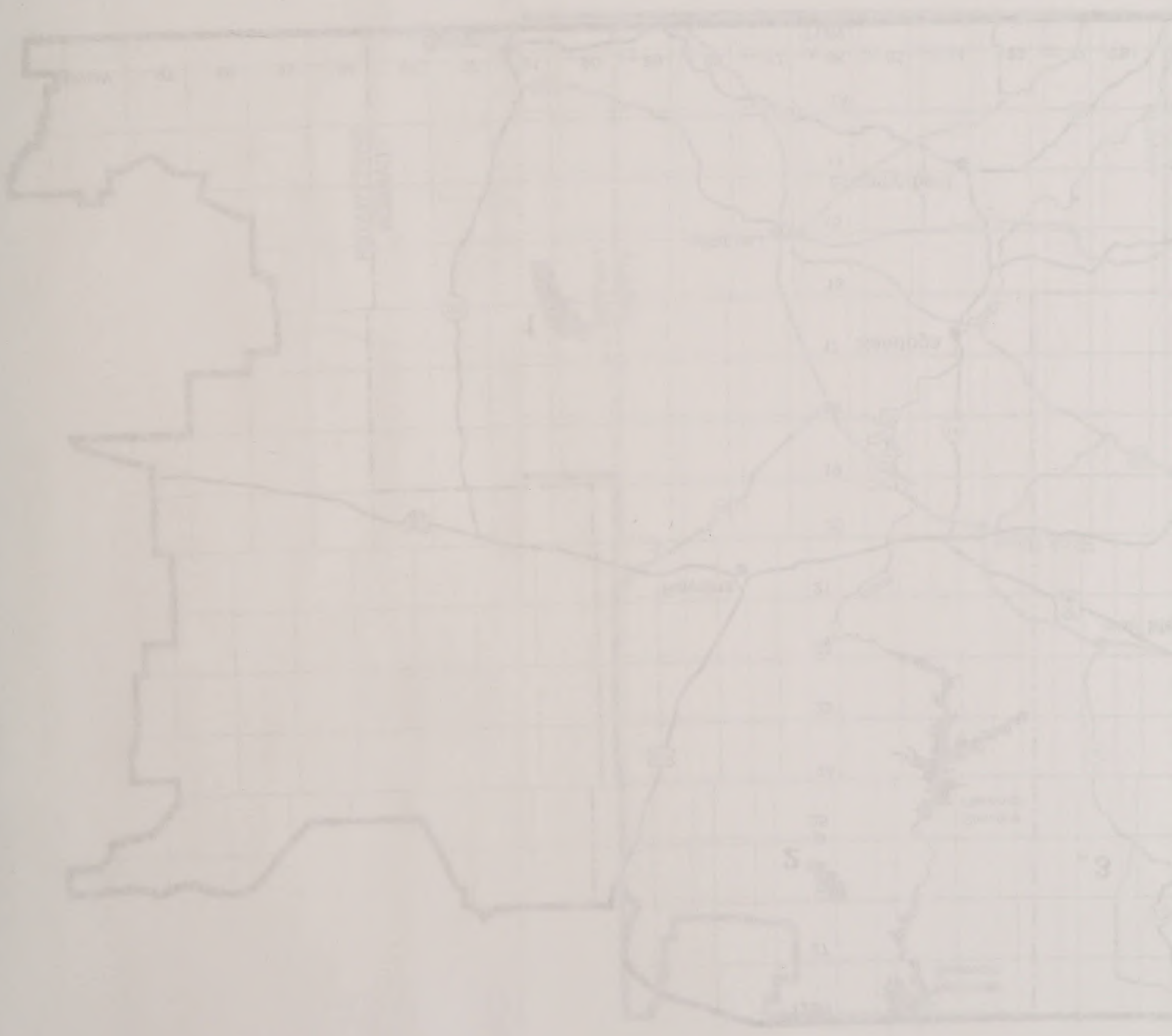
Miles

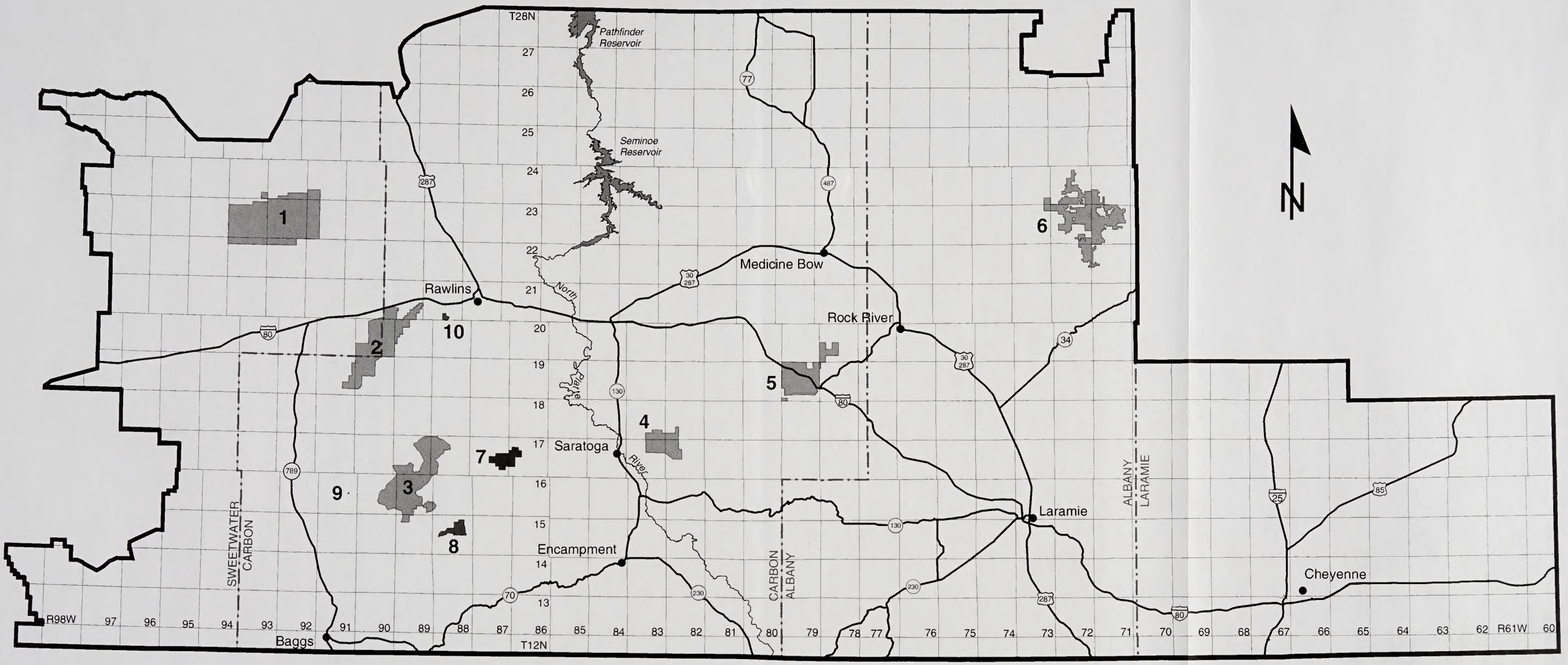
Map 2-9

Areas of Critical Environmental Concern

Alternative 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Wildlife Habitat Management Areas

1 Chain Lakes
2 Red Rim-Daley
3 Grizzly Allotment
4 Pennock Mountain
5 Wick-Beumee
6 Laramie Peak

Research Area

7 Stratton Sagebrush Steppe

Management Areas

8 High Savery Dam
9 JO Ranch Site
10 Rawlins OHV Area

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

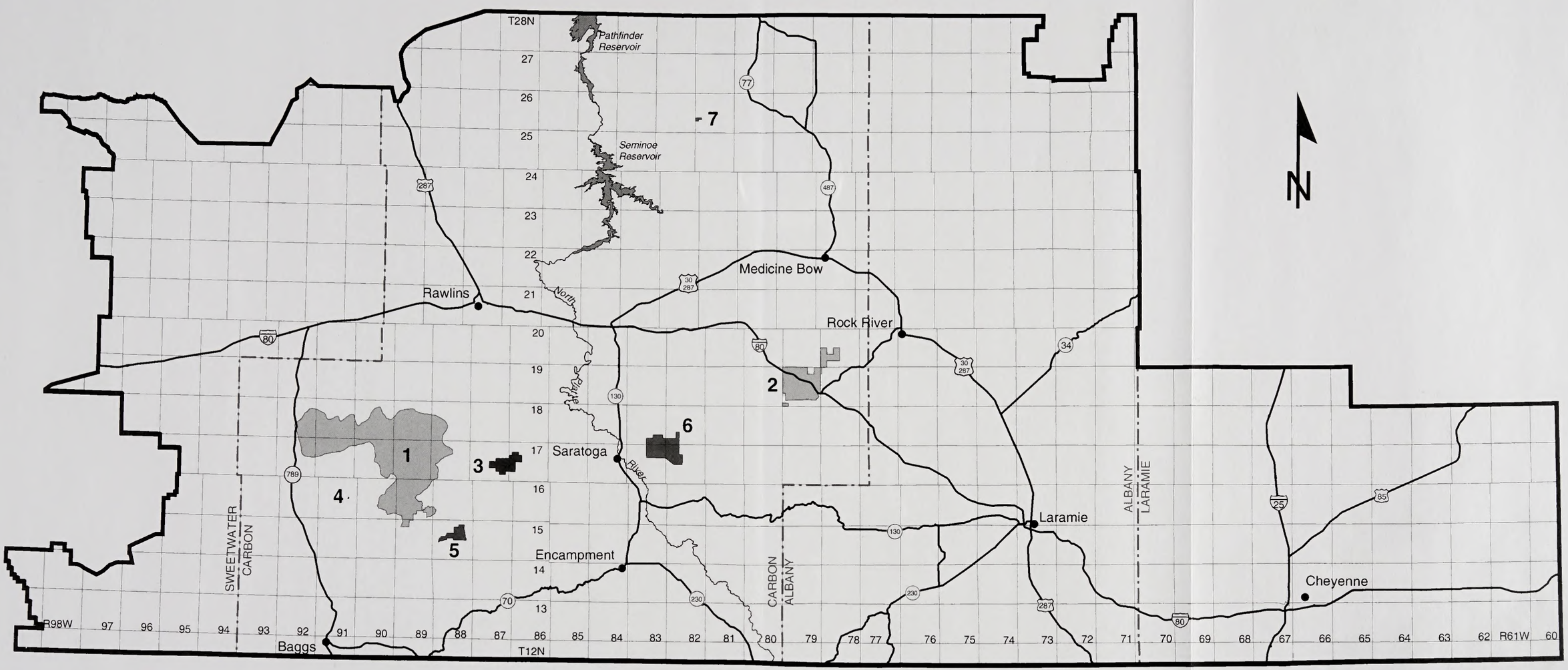
Map 2-10

Other Special Management Areas

Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Wildlife Habitat Management Area

1 Upper Muddy Creek Watershed/Grizzly

2 Pennock Mountain

Research Area

3 Stratton Sagebrush Steppe

Management Area

4 JO Ranch Site

5 High Savery Dam

6 Pennock Mountain

7 Shirley Mountain Bat Cave Area

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

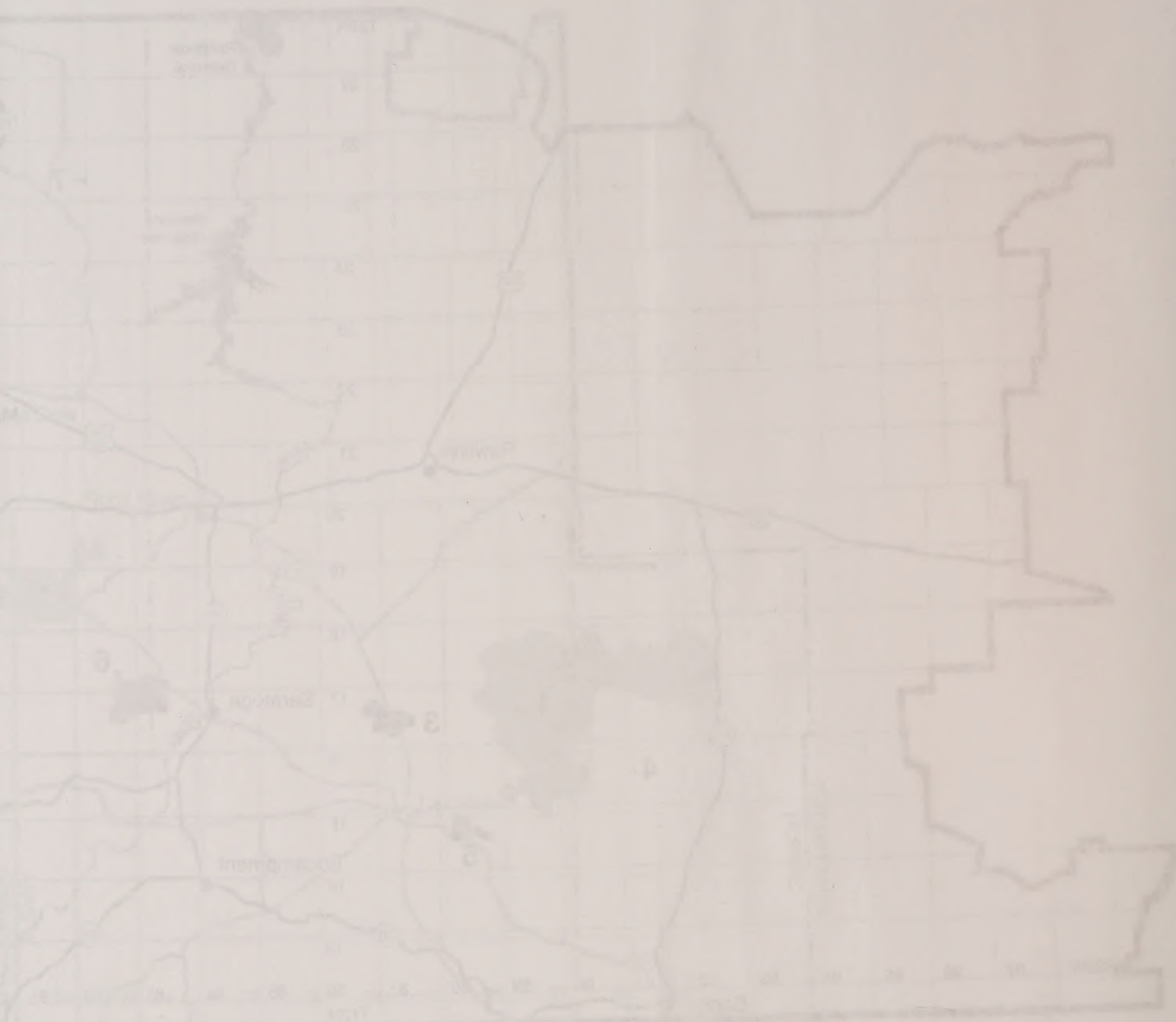
Miles

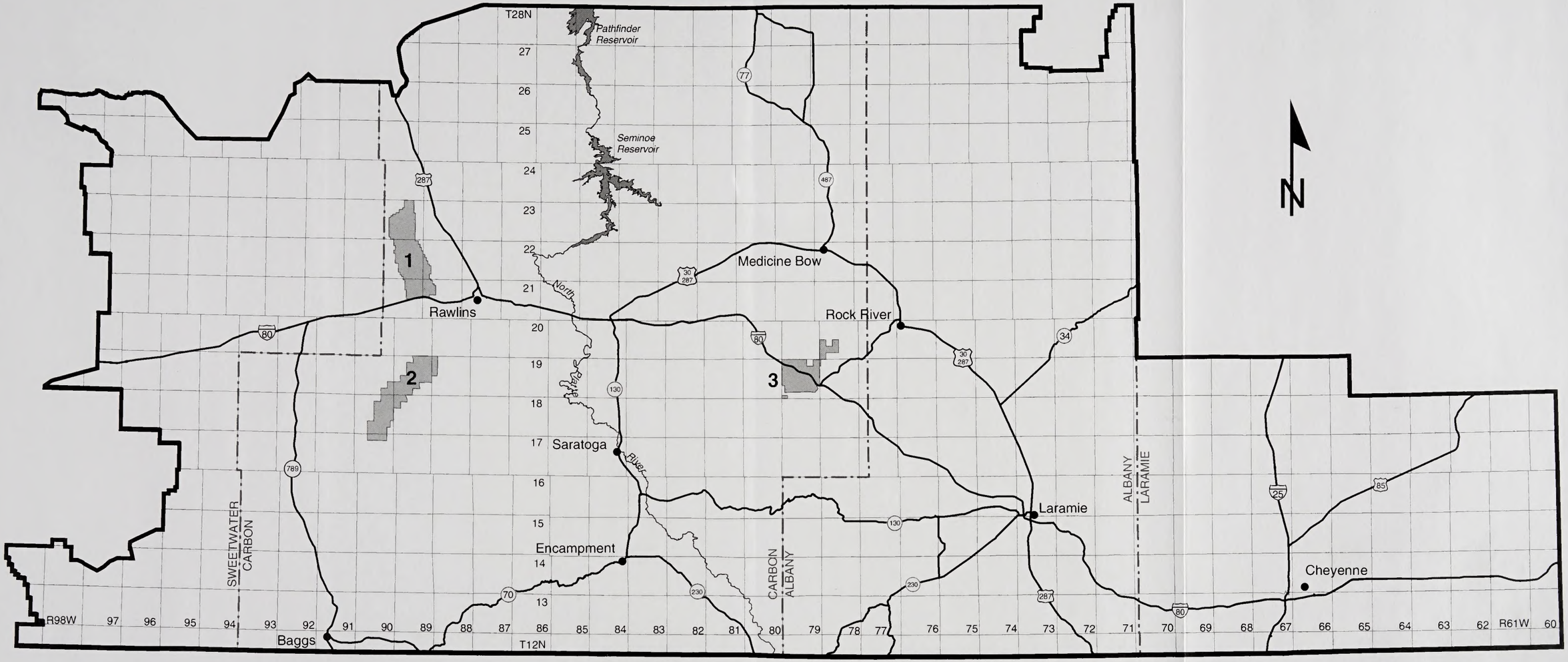
Map 2-11

Other Special Management Areas

Alternative 2

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Wildlife Habitat Management Area

1 Shamrock Hills

2 Jep Canyon

3 Wick-Beumee

0 10 20 40 60 80 100
Kilometers

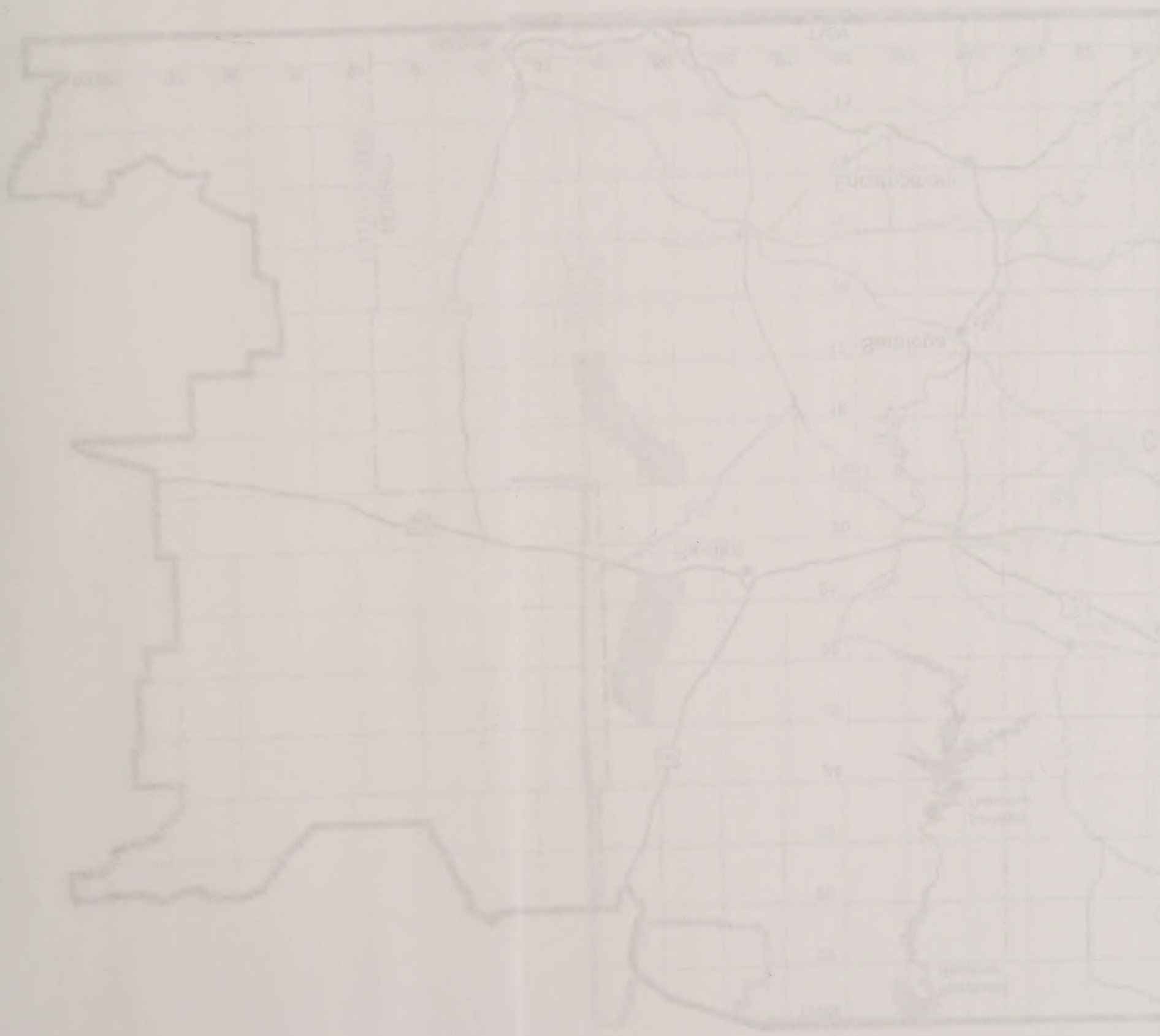
0 5 10 20 30 40 50
Miles

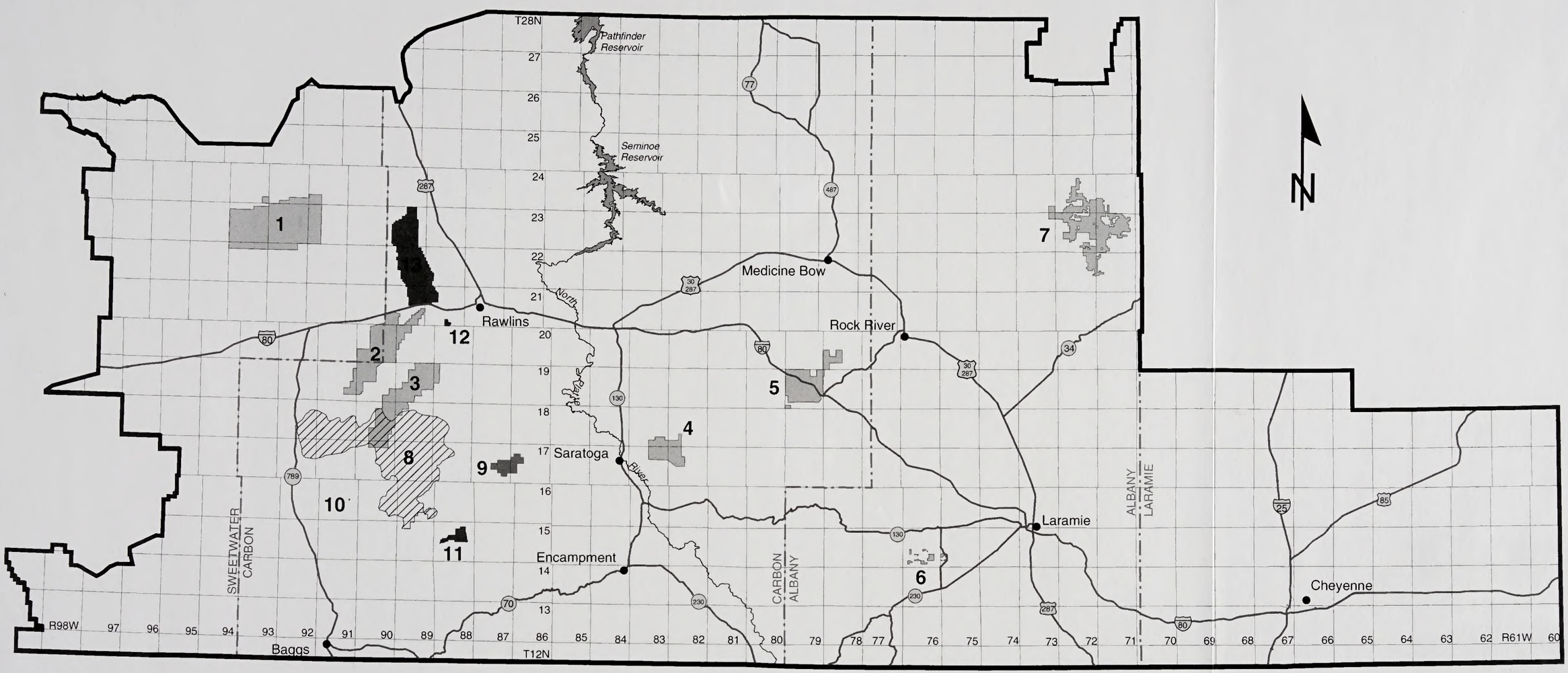
Map 2-12

Other Special Management Areas

Alternative 3

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





- Wildlife Habitat Management Area
  - **1** Chain Lakes
  - **2** Red Rim-Daley
  - **3** Jep Canyon
  - **4** Pennock Mountain
  - **5** Wick-Beumee
  - **6** Laramie Plains Lakes
  - **7** Laramie Peak
- Fish Habitat Management Area
  - **8** Upper Muddy Creek/Grizzly
- Research Area
  - **9** Stratton Sagebrush Steppe
- Management Area
  - **10** JO Ranch Site
  - **11** High Savery Dam
  - **12** Rawlins OHV Area
  - **13** Shamrock Hills

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

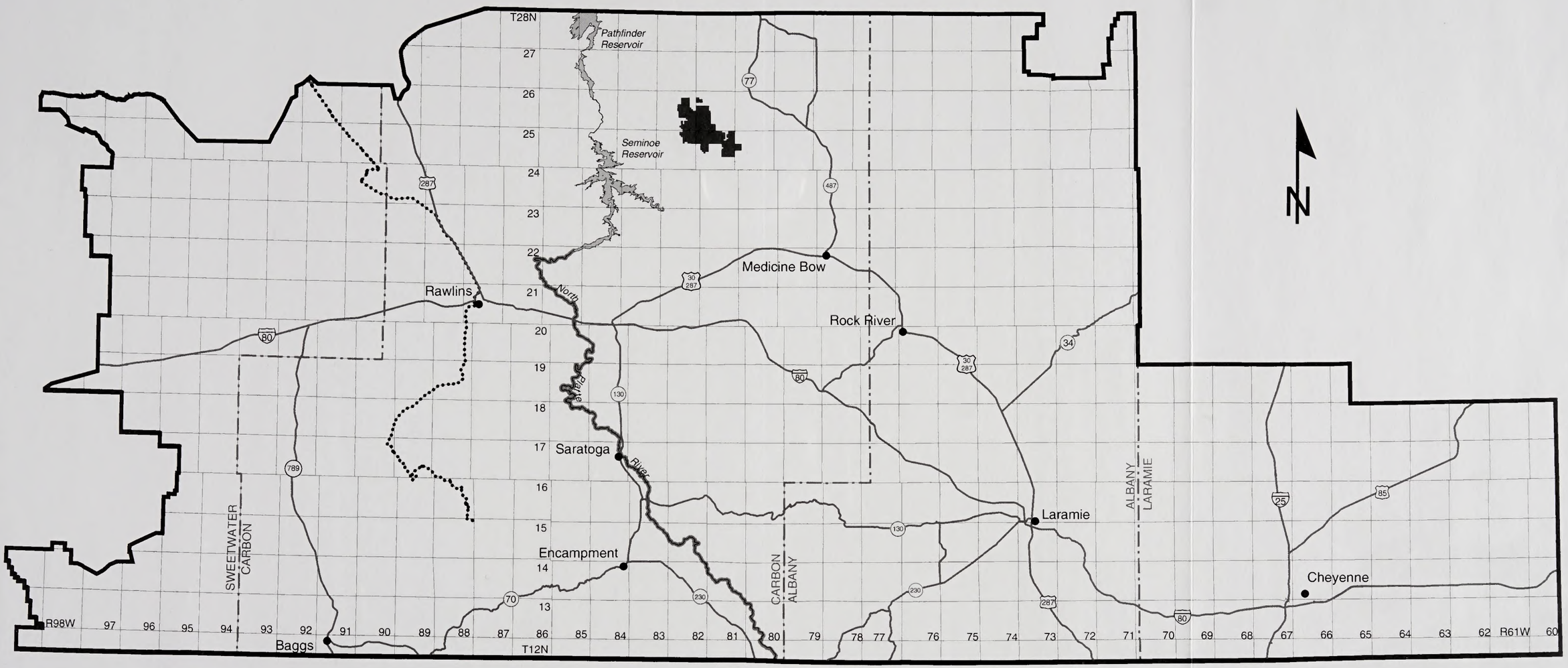
Map 2-13

Other Special Management Areas

Alternative 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Continental Divide National Scenic Trail

North Platte

Shirley Mountain

0 10 20 40 60 80 100
Kilometers

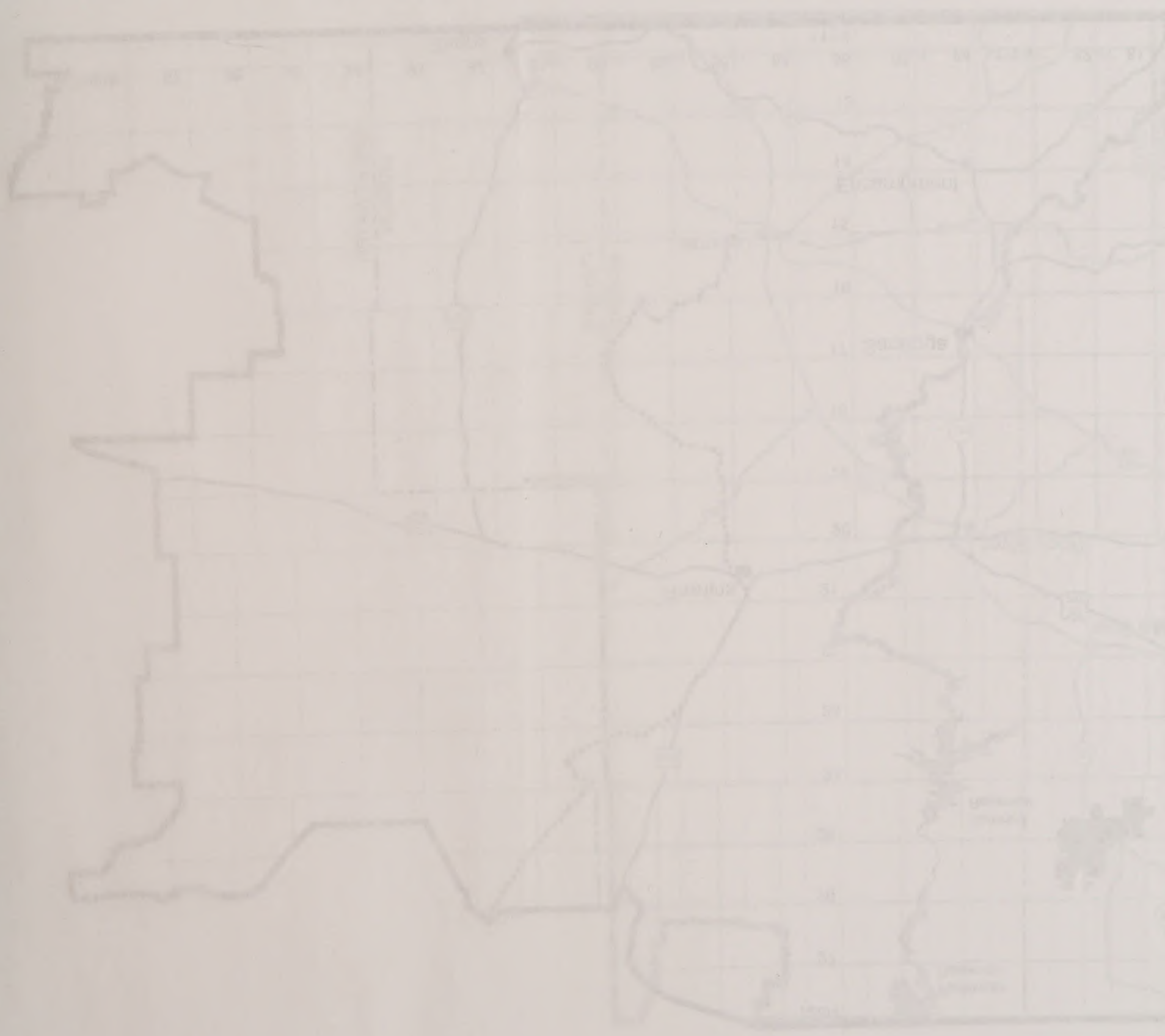
0 5 10 20 30 40 50
Miles

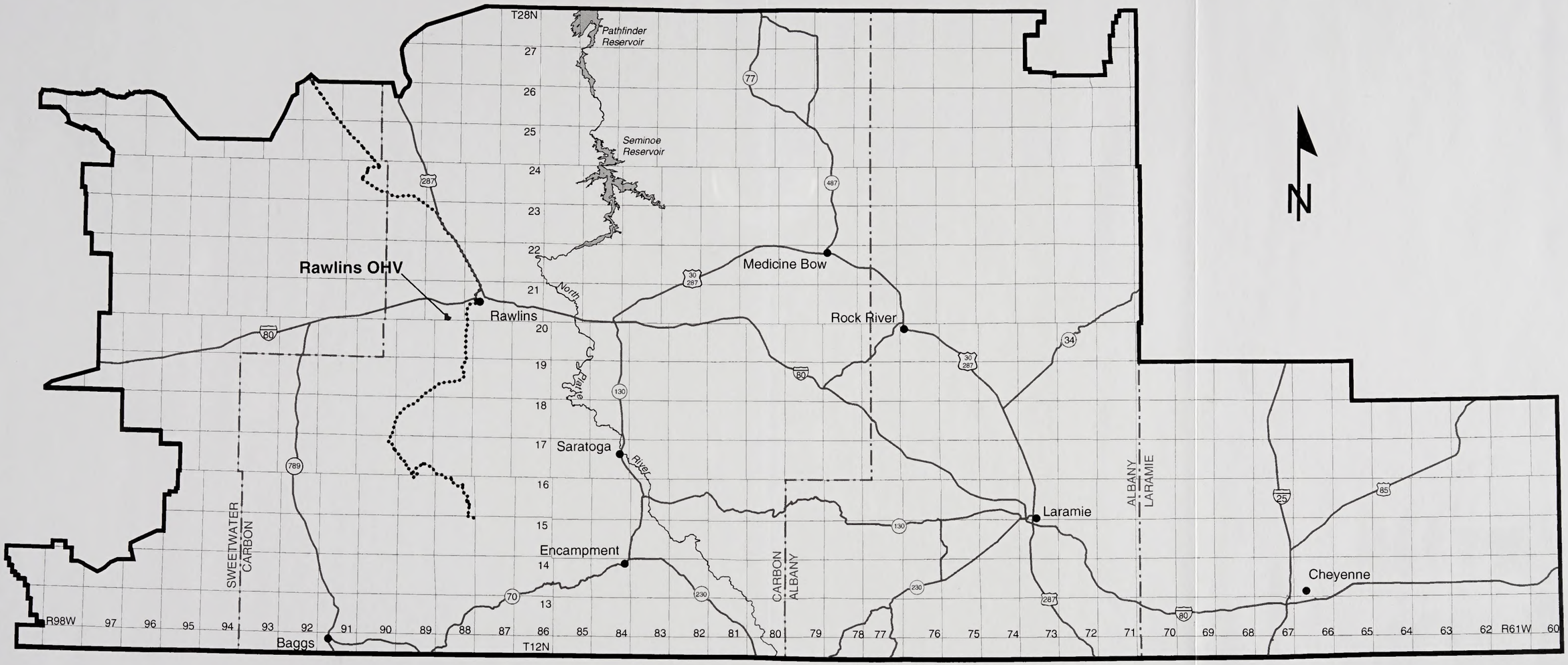
Map 2-14

Special Recreation Management Areas

Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Continental Divide National Scenic Trail

Rawlins OHV

0 10 20 40 60 80 100
Kilometers

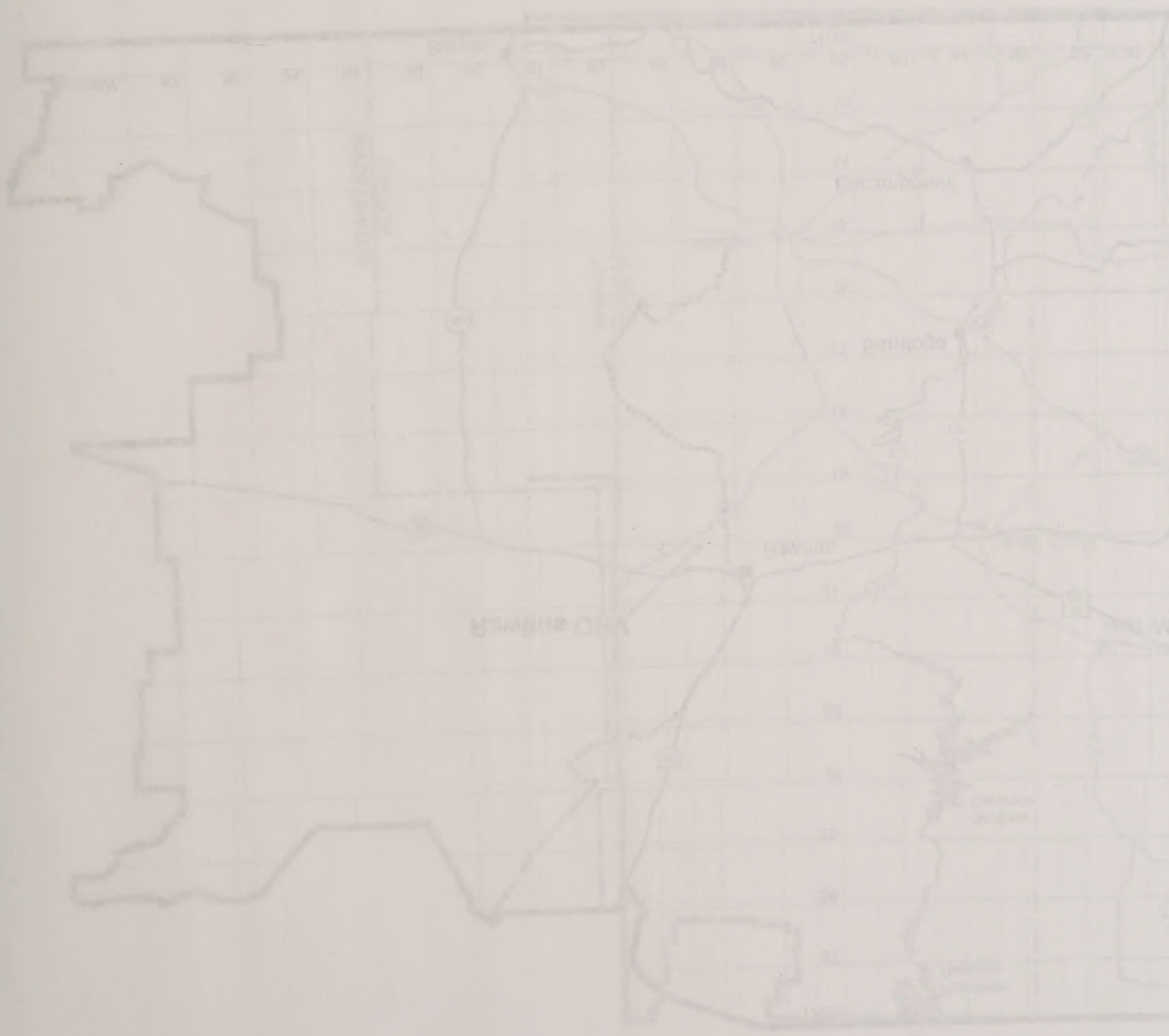
0 5 10 20 30 40 50
Miles

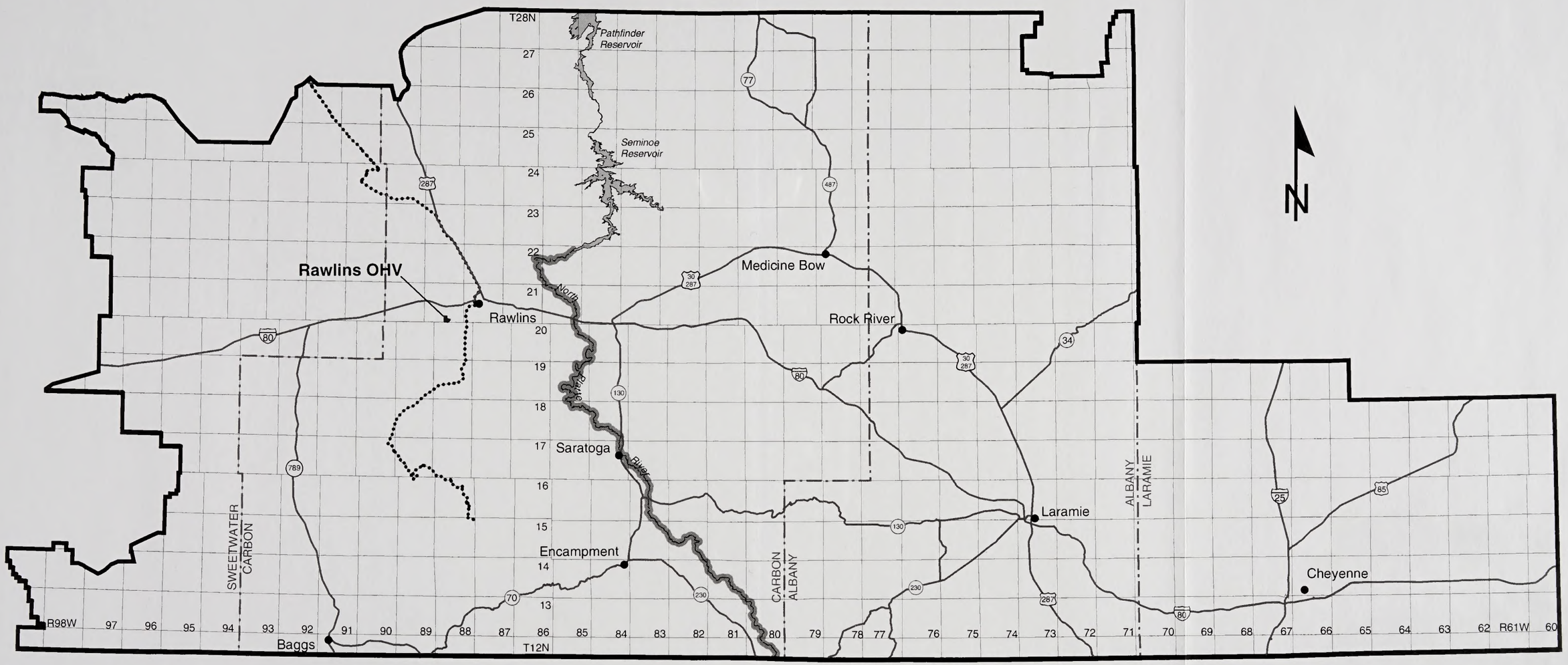
Map 2-15

Special Recreation Management Areas

Alternative 2

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Continental Divide National Scenic Trail

North Platte

Rawlins OHV

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

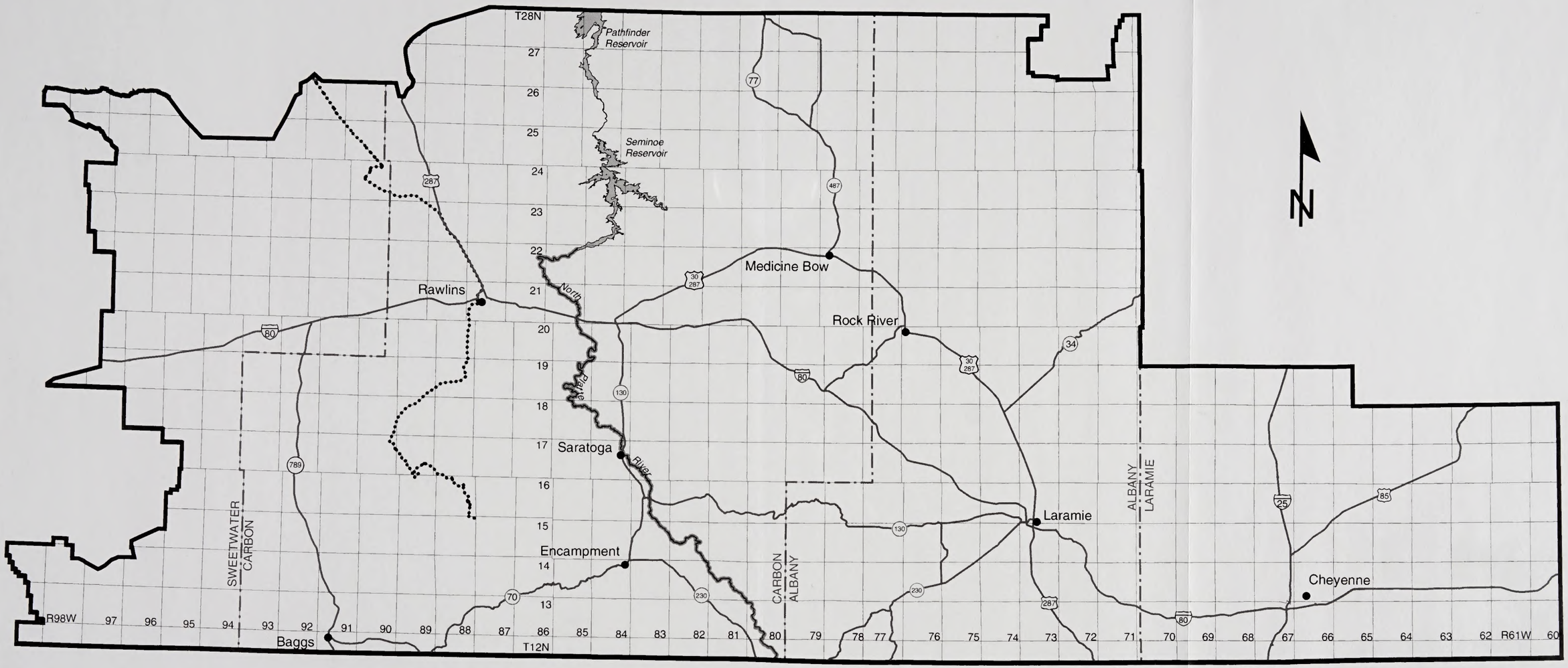
Map 2-16

Special Recreation Management Areas

Alternative 3

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Continental Divide National Scenic Trail

North Platte

0 10 20 40 60 80 100
Kilometers

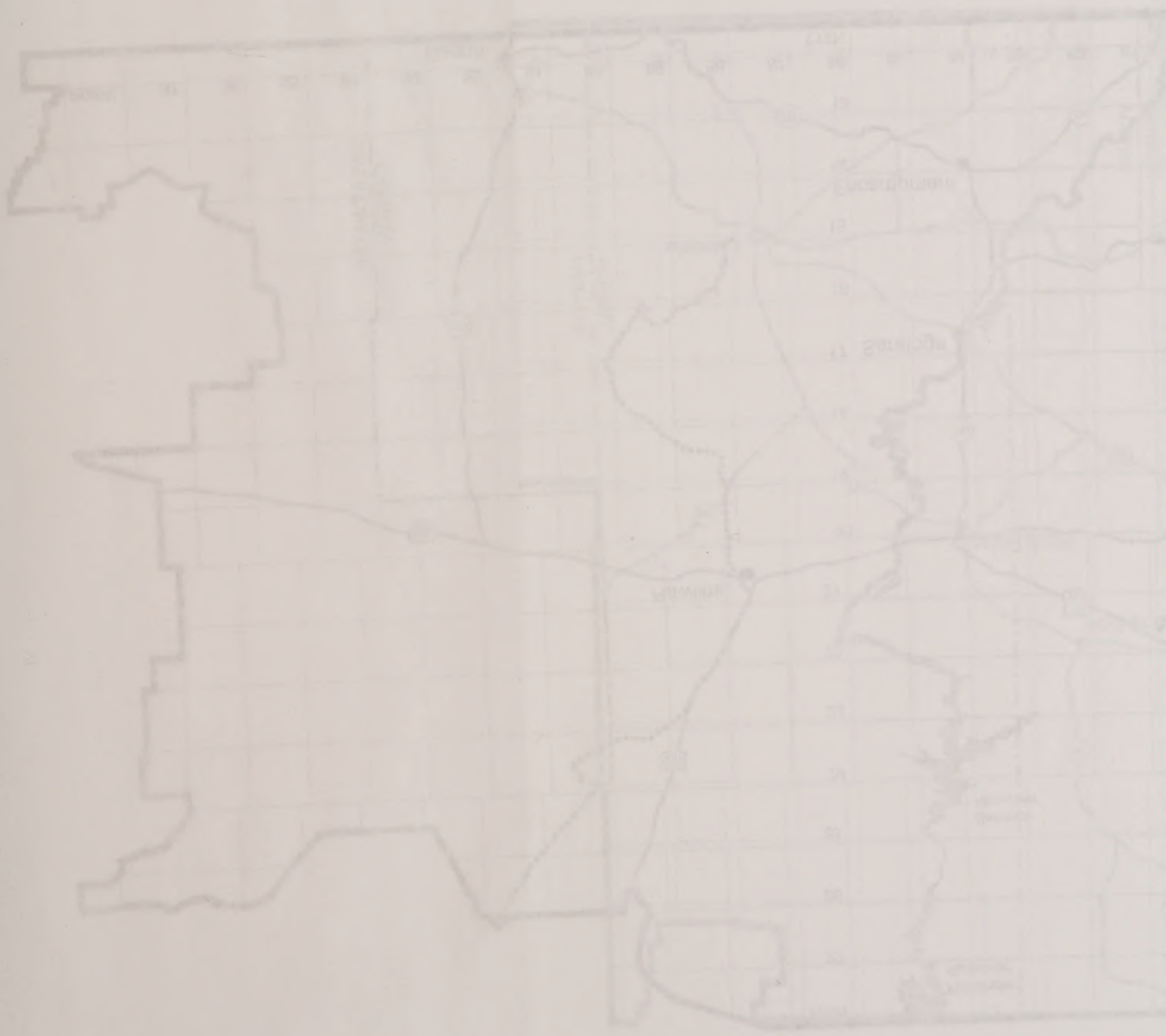
0 5 10 20 30 40 50
Miles

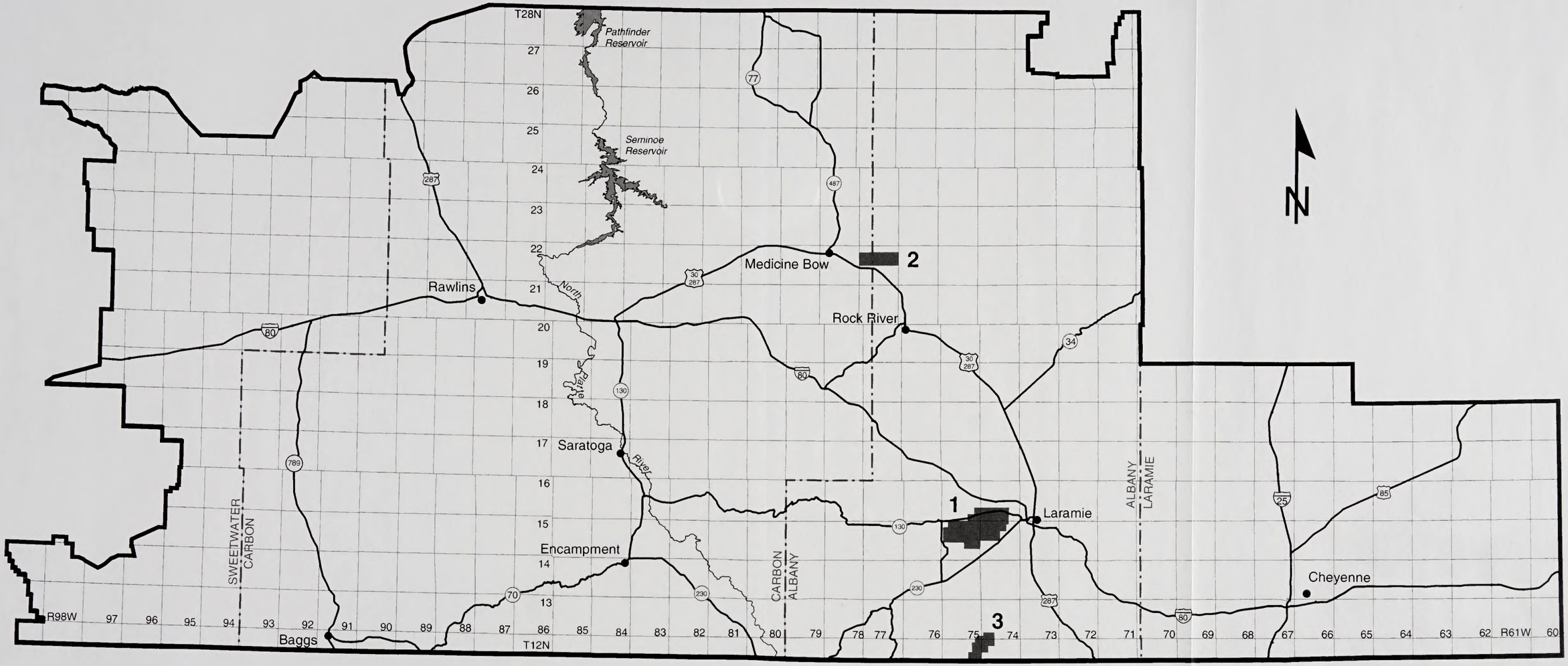
Map 2-17

Special Recreation Management Areas

Alternative 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





- National Natural Landmarks
- **1** Big Hollow
- **2** Como Bluffs
- **3** Sand Creek

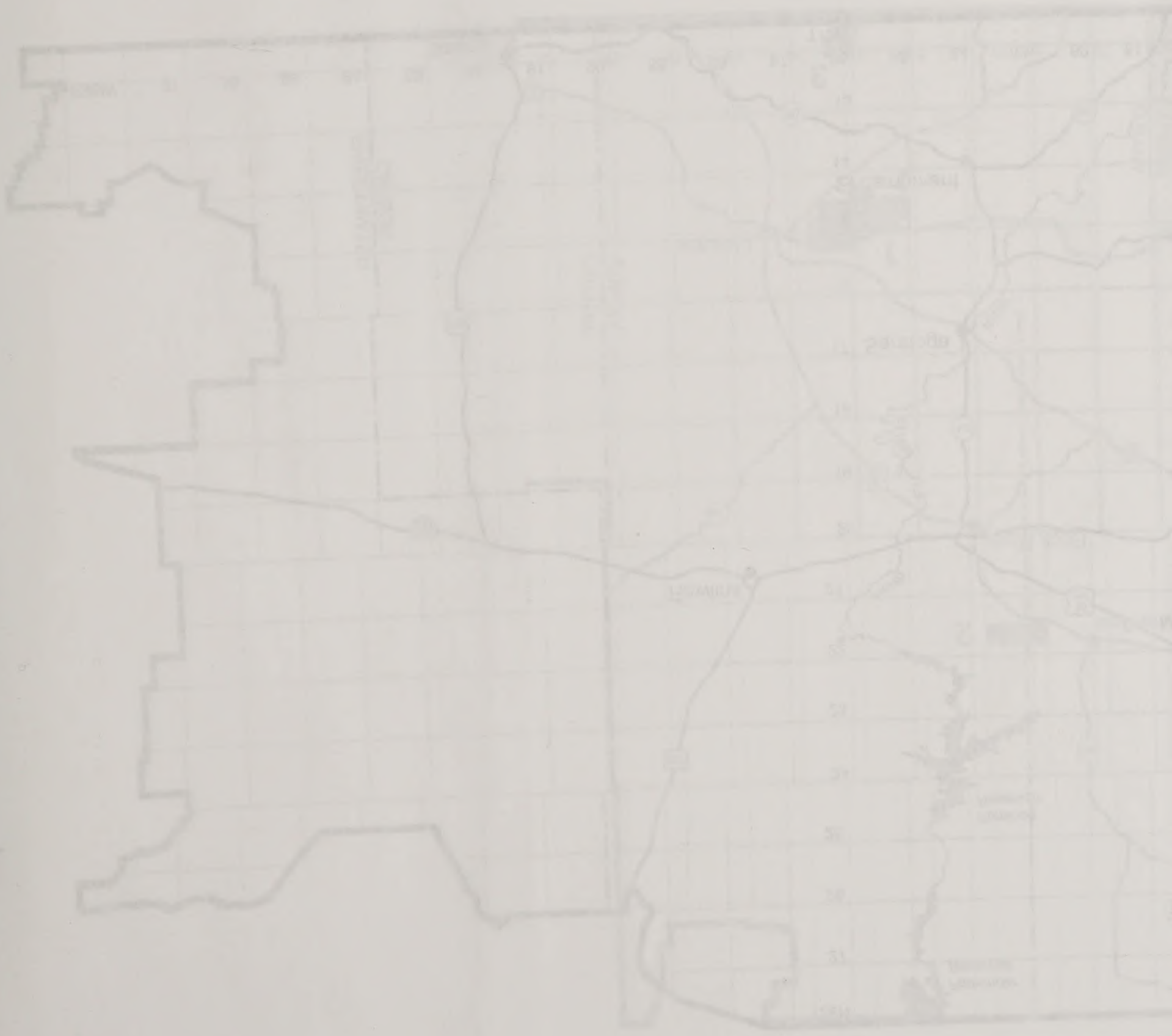
0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 2-18

National Natural Landmarks

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM

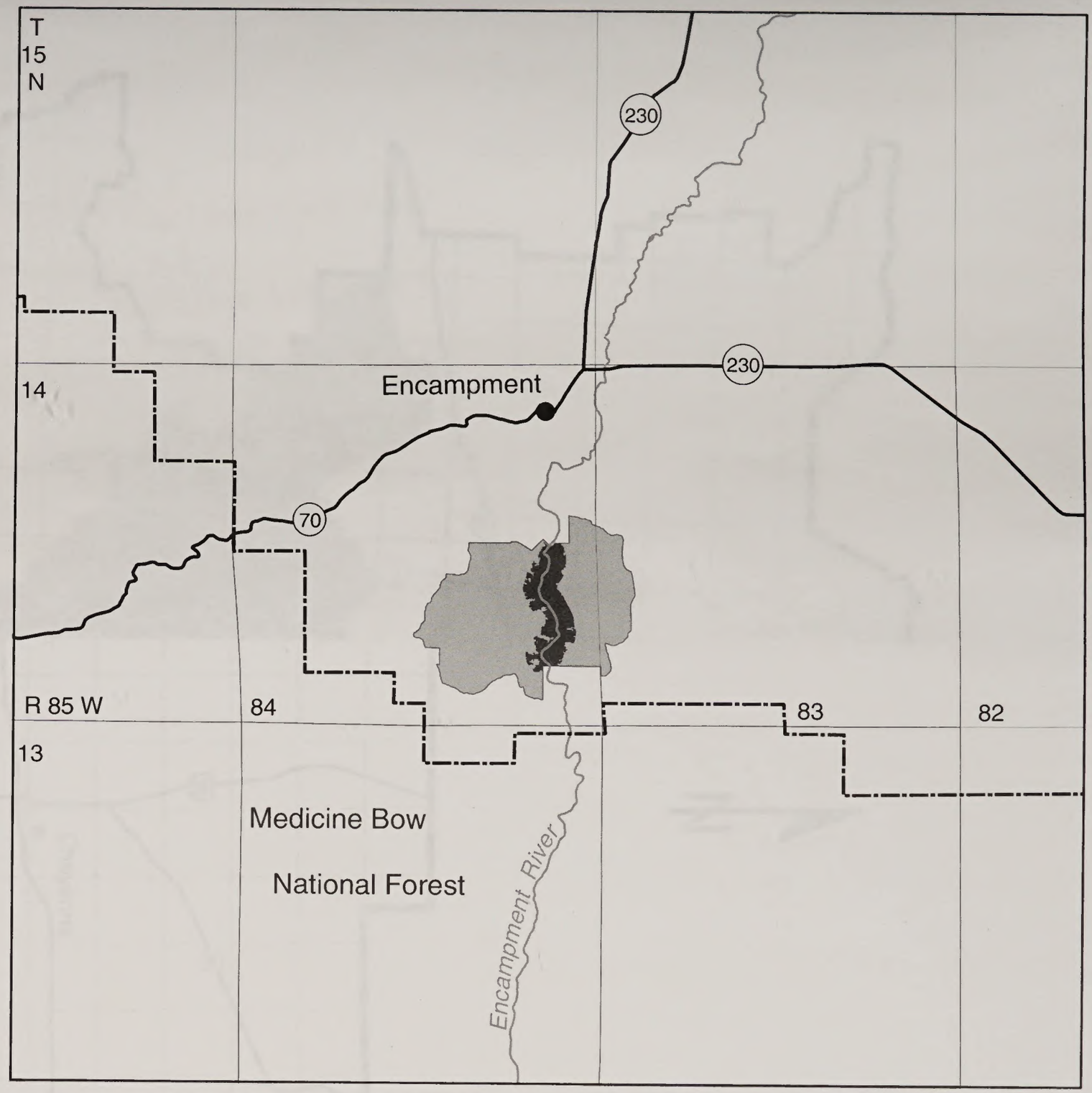


N

Potential Wild and Scenic River

Encampment River Wilderness Study Area

National Forest Boundary





0 1 2 4 6 8 10
Kilometers

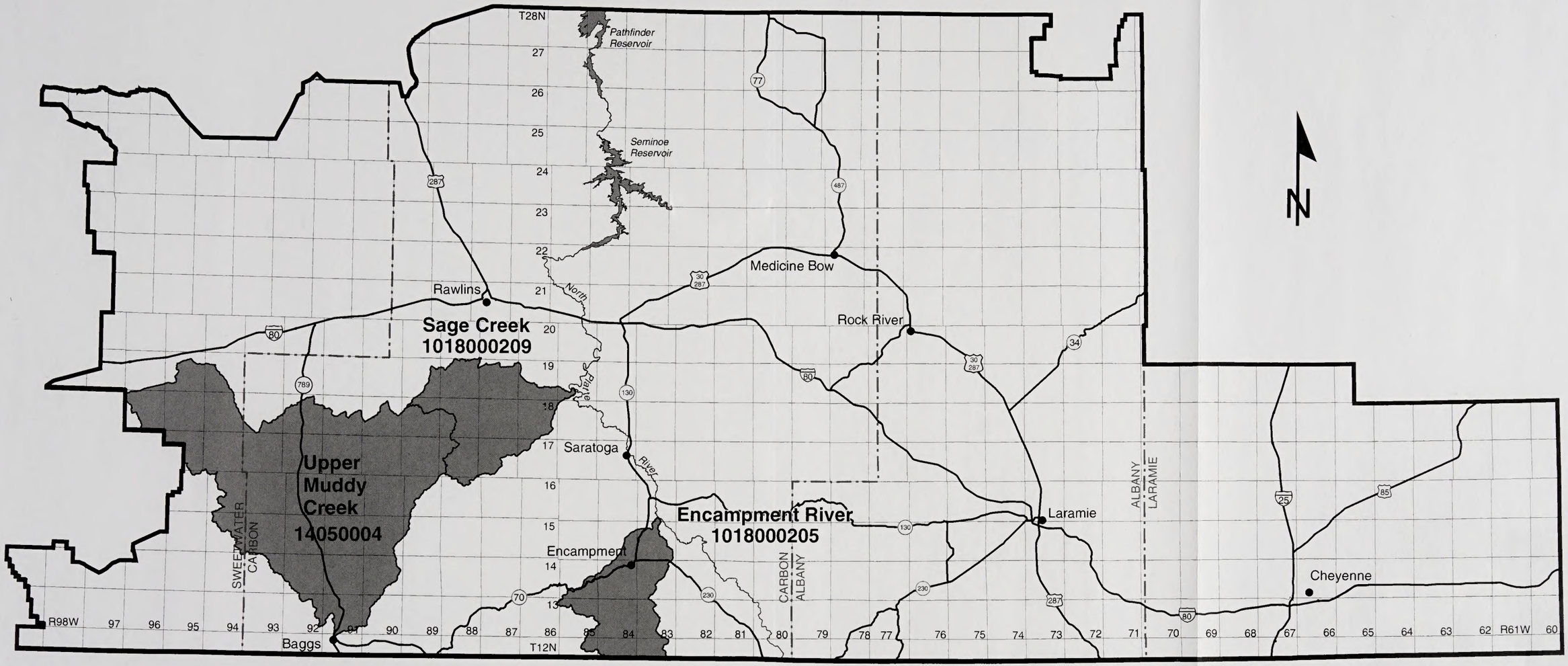
0 0.5 1 2 3 4 5
Miles

Map 2-19
Encampment River Potential Wild and Scenic River

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM




N
NP
T



Hydrologic Unit Code Boundary and Name

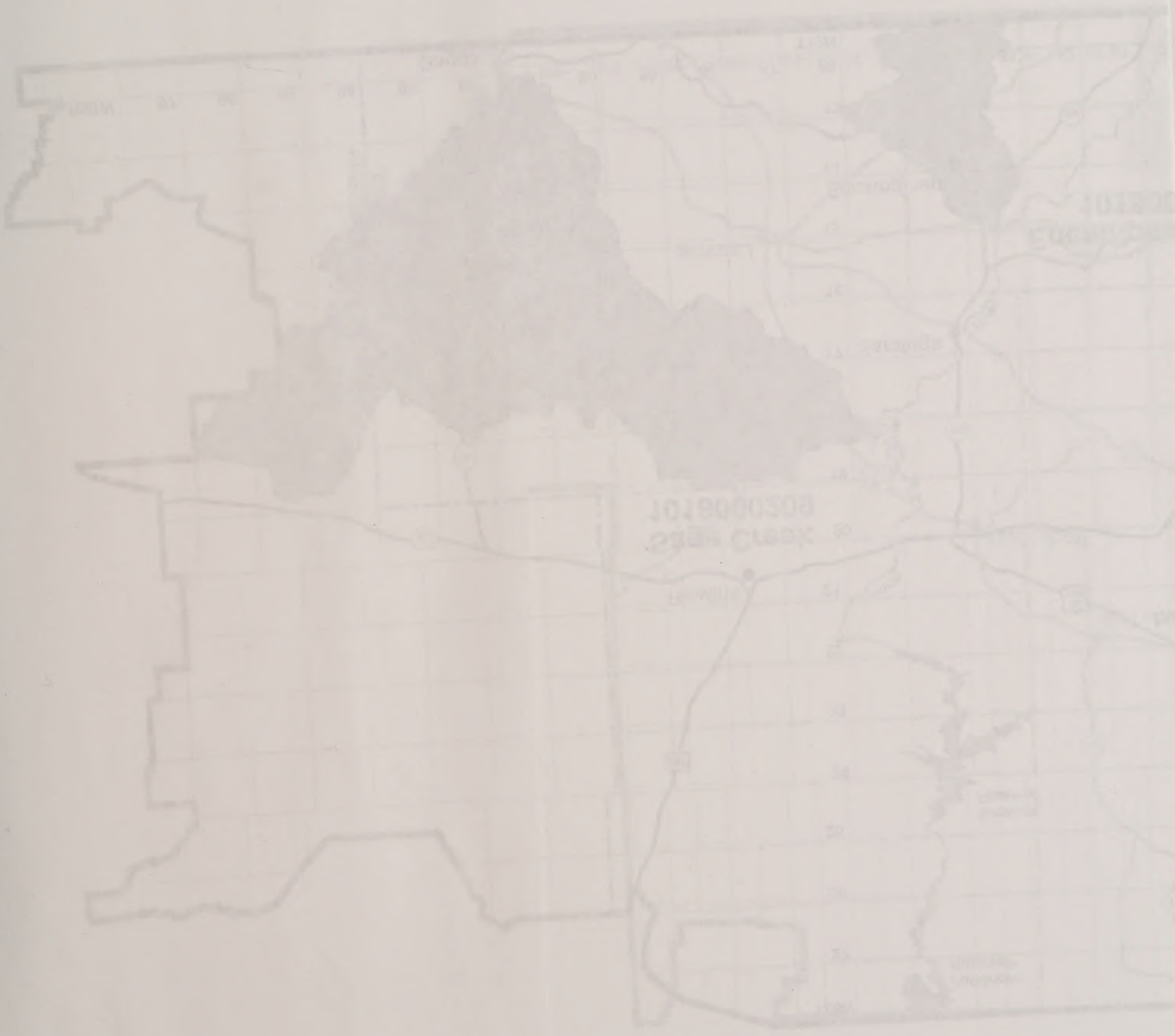
0 10 20 40 60 80 100
Kilometers

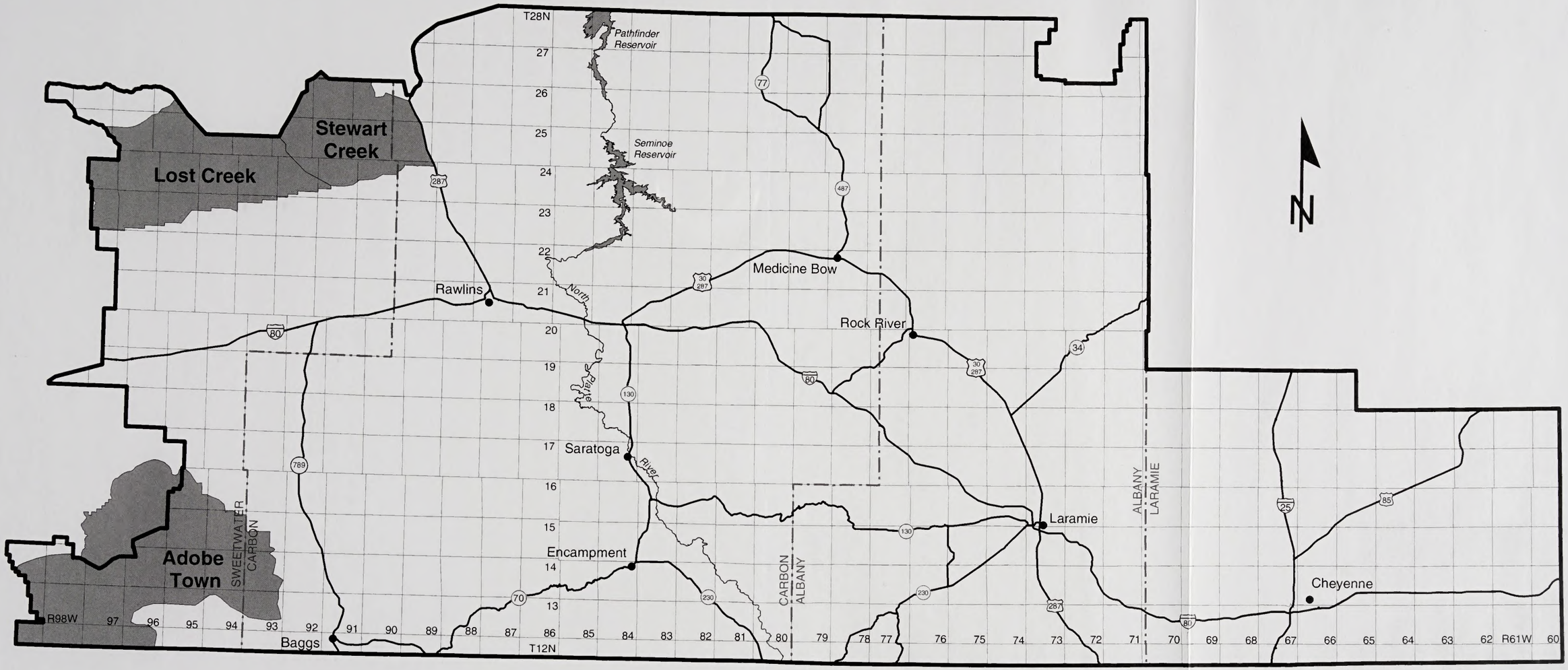
0 5 10 20 30 40 50
Miles

Map 2-20

Watersheds with
Management Actions

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Herd Management Areas

0 10 20 40 60 80 100
Kilometers

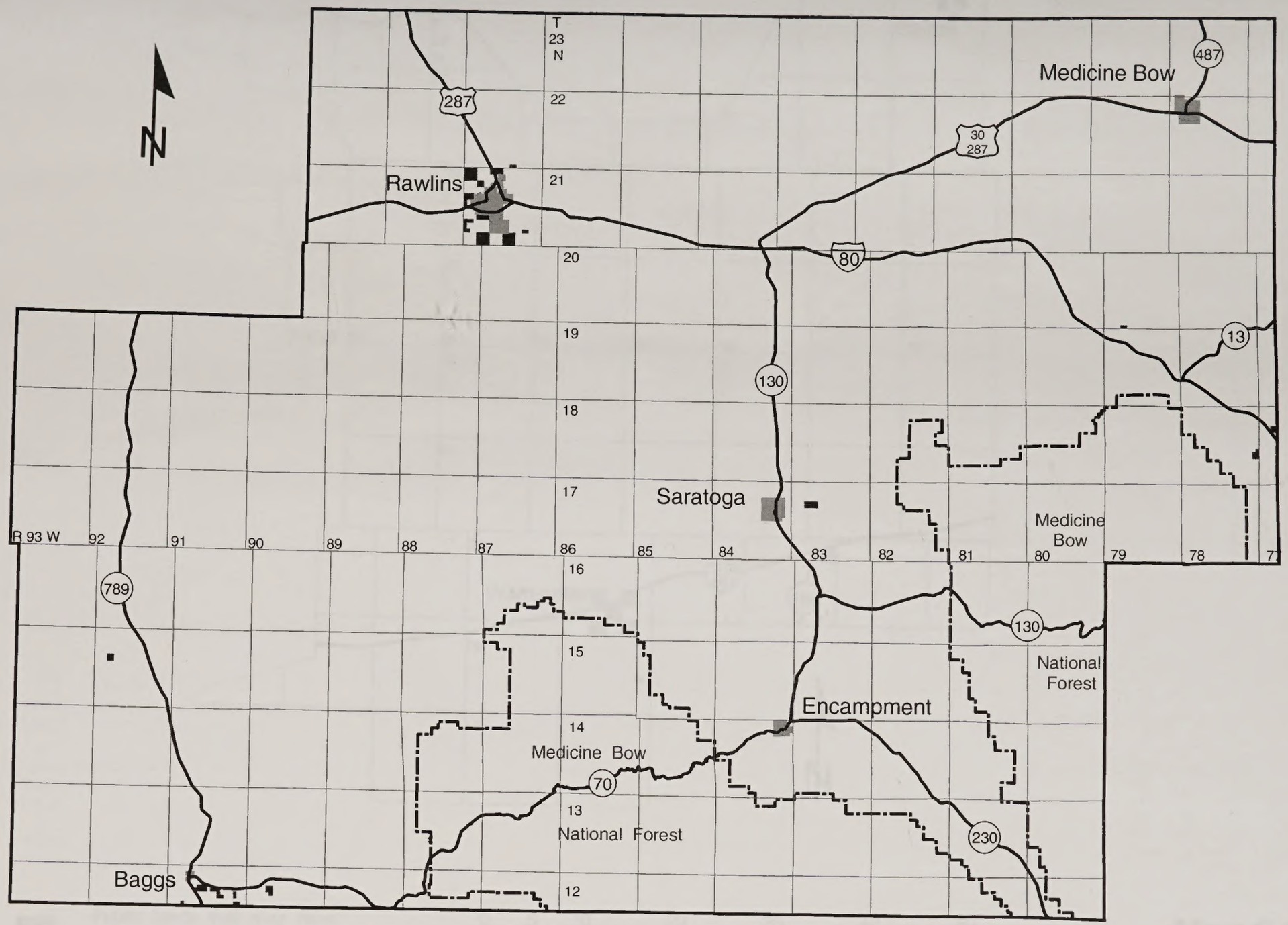
0 5 10 20 30 40 50
Miles

Map 2-21

Wild Horse Herd Management Areas

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





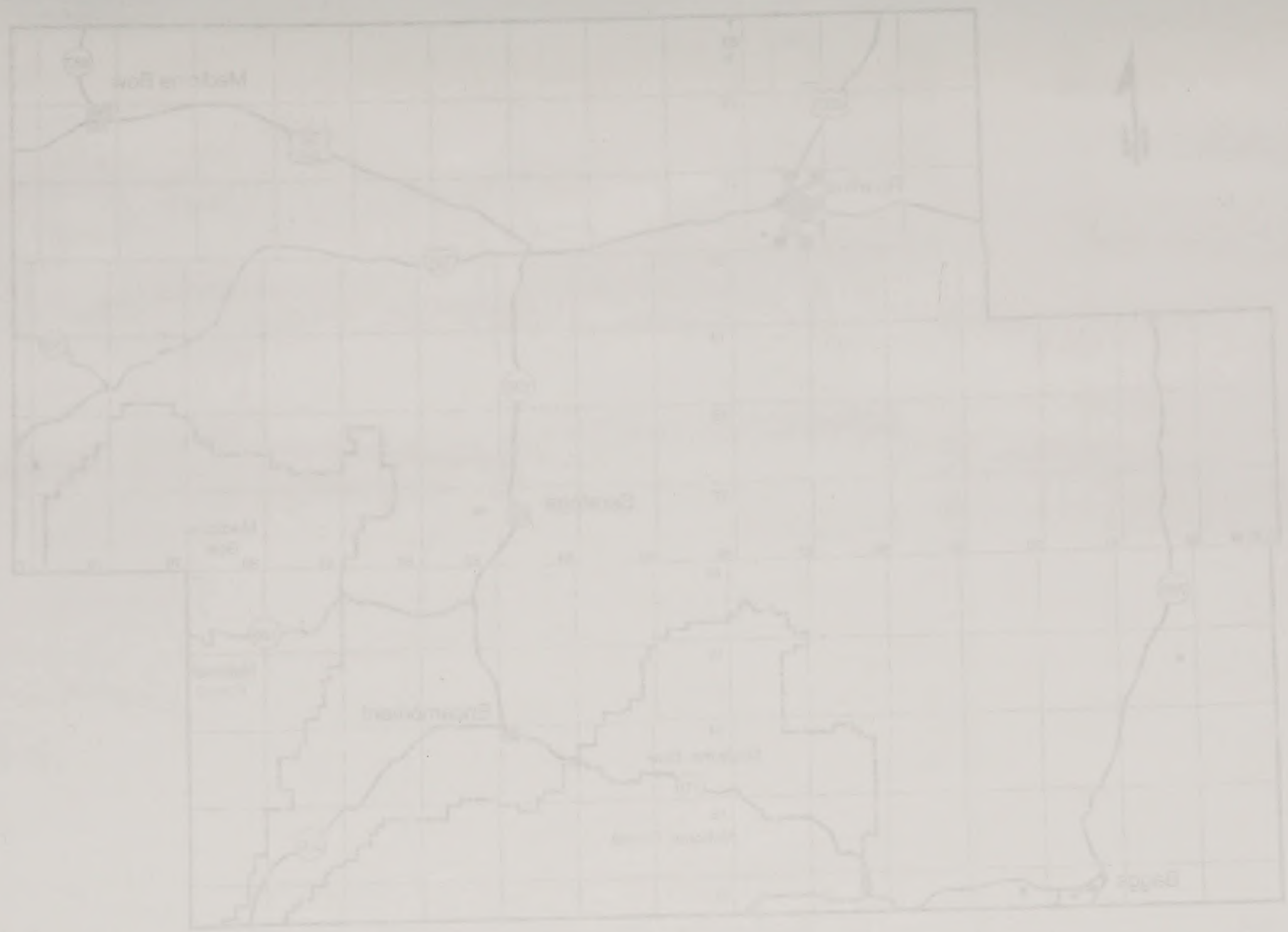
Public lands that may have potential for disposal or transfer

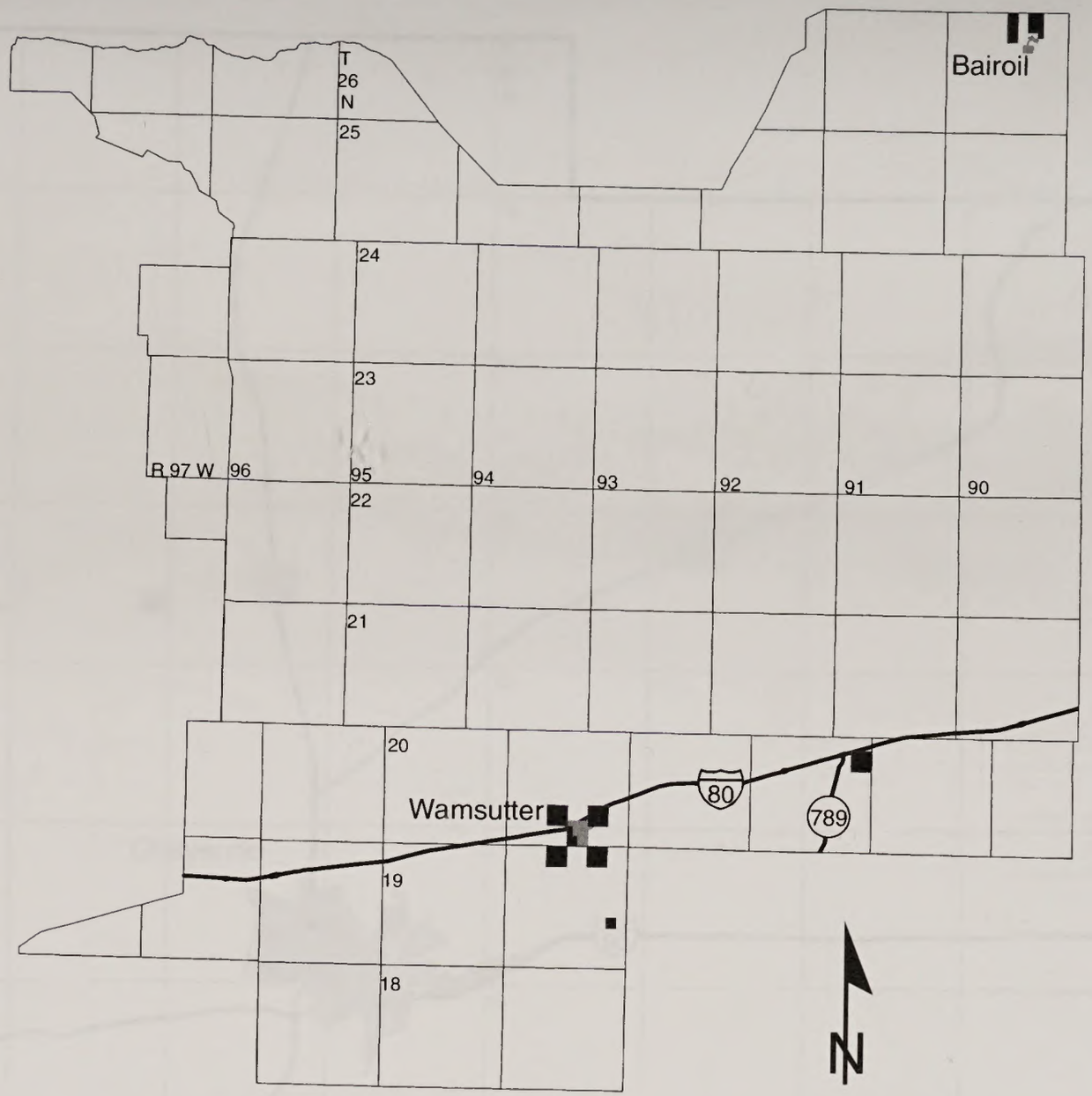
0 5 10 20 30 40 50
Kilometers

0 2.5 5 10 15 20 25
Miles

Map 2-22
Potential Disposals - Carbon County
Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Public lands that may have potential for disposal or transfer

0 5 10 20 30 40 50
Kilometers

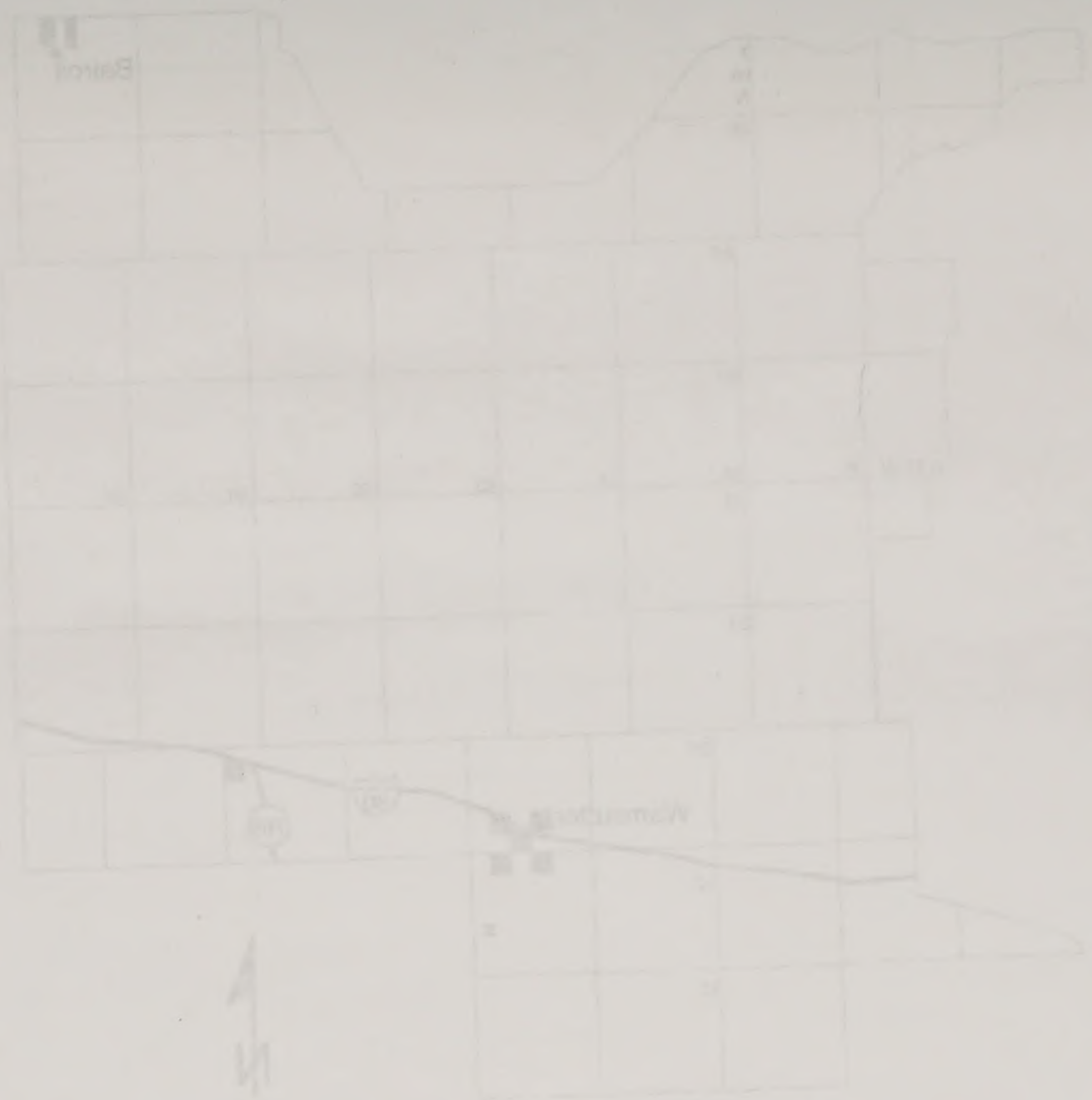
0 2.5 5 10 15 20 25
Miles

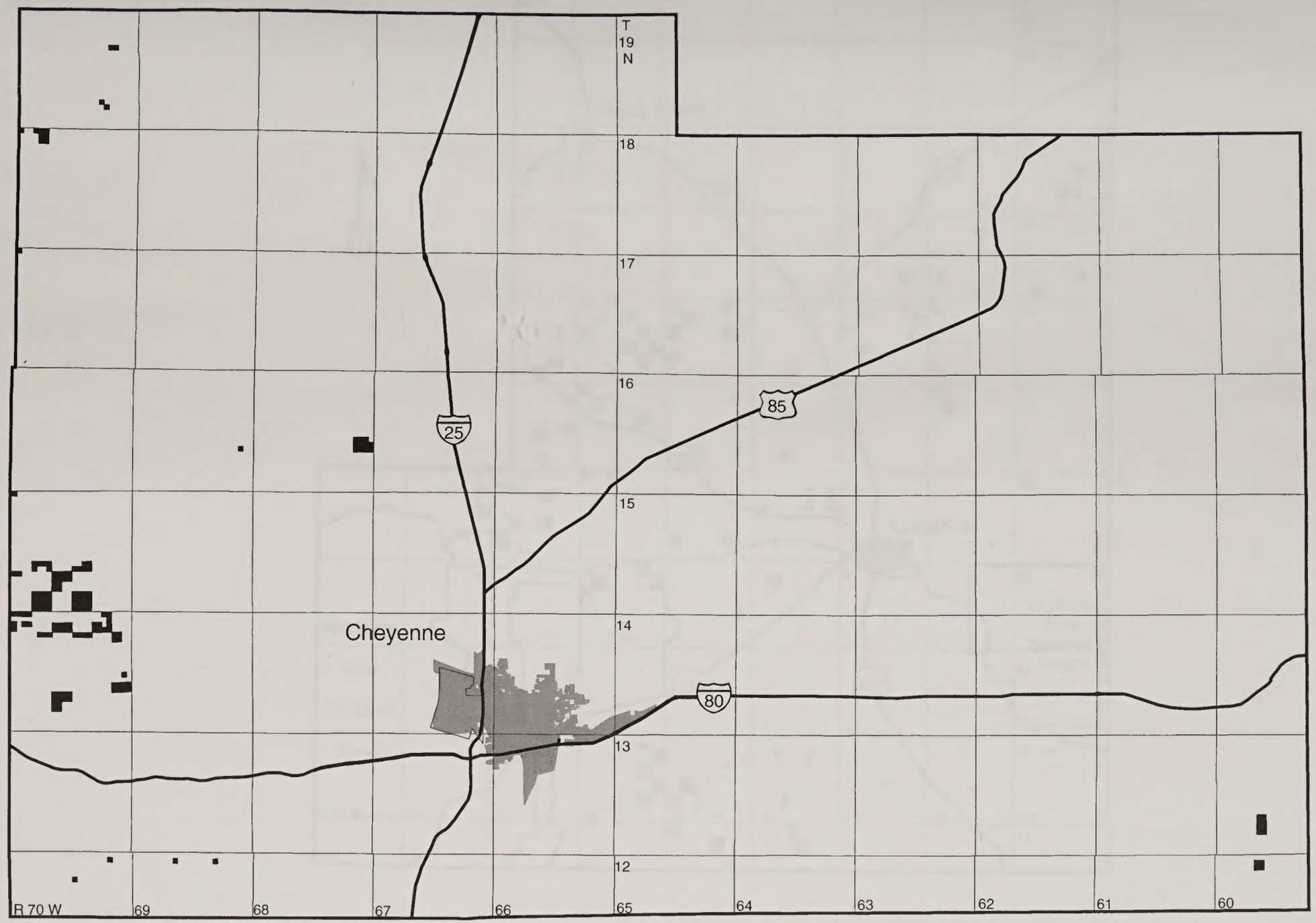
Map 2-23

Potential Disposals - Sweetwater County

Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Public lands that may have potential for disposal or transfer

0 5 10 20 30 40 50
Kilometers

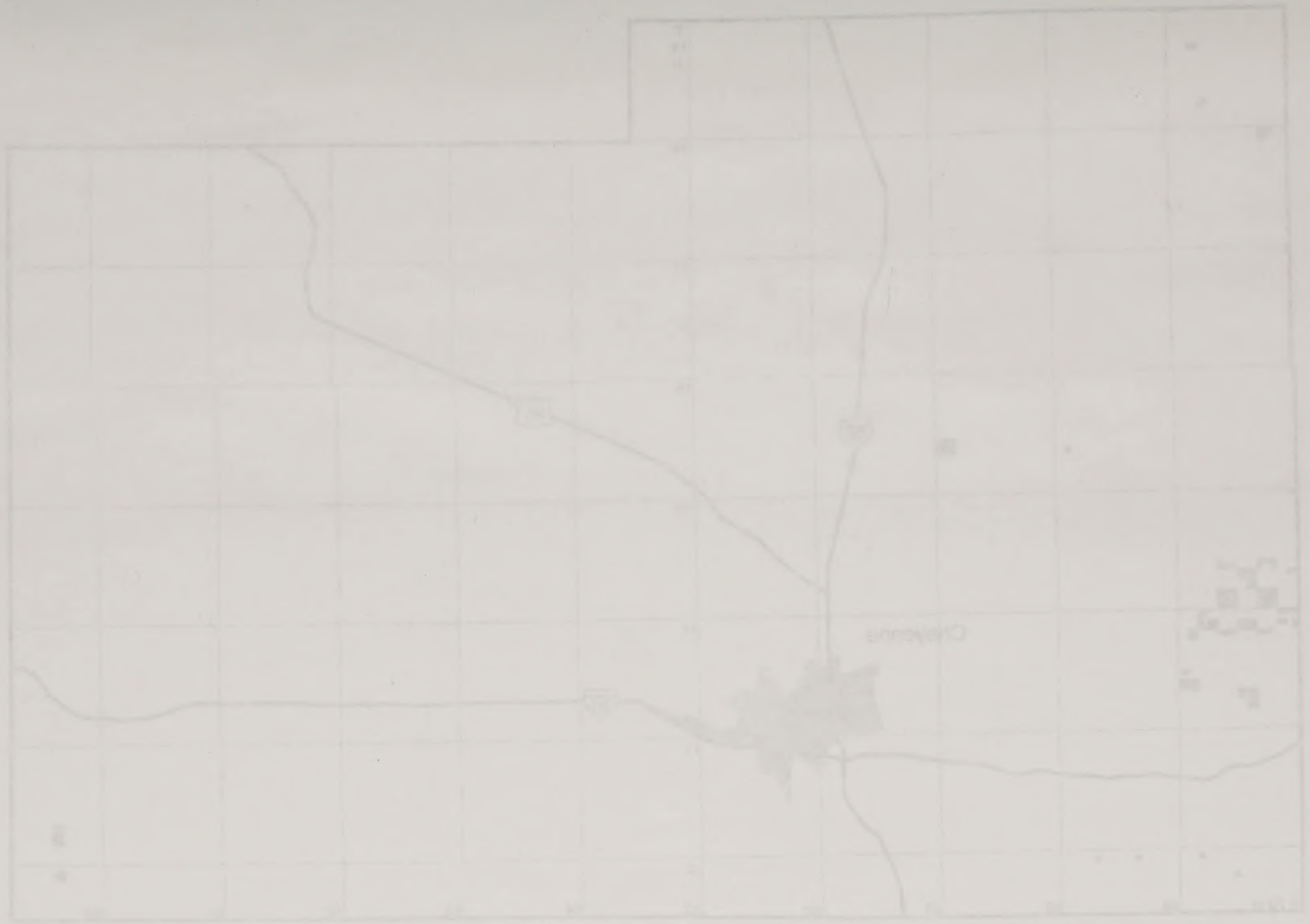
0 2.5 5 10 15 20 25
Miles

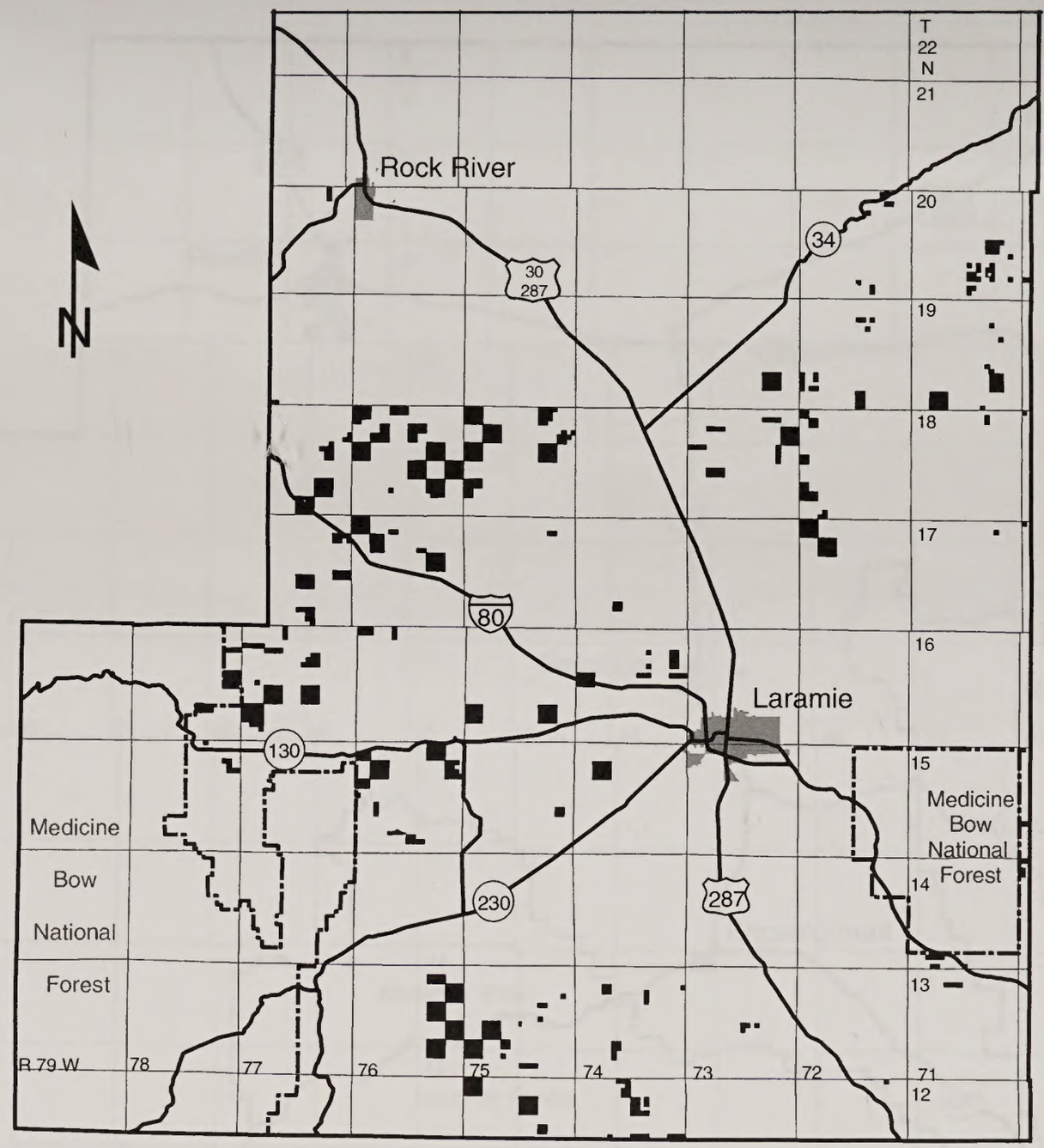
Map 2-24

Potential Disposals - Laramie County

Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Public lands that may have potential for disposal or transfer

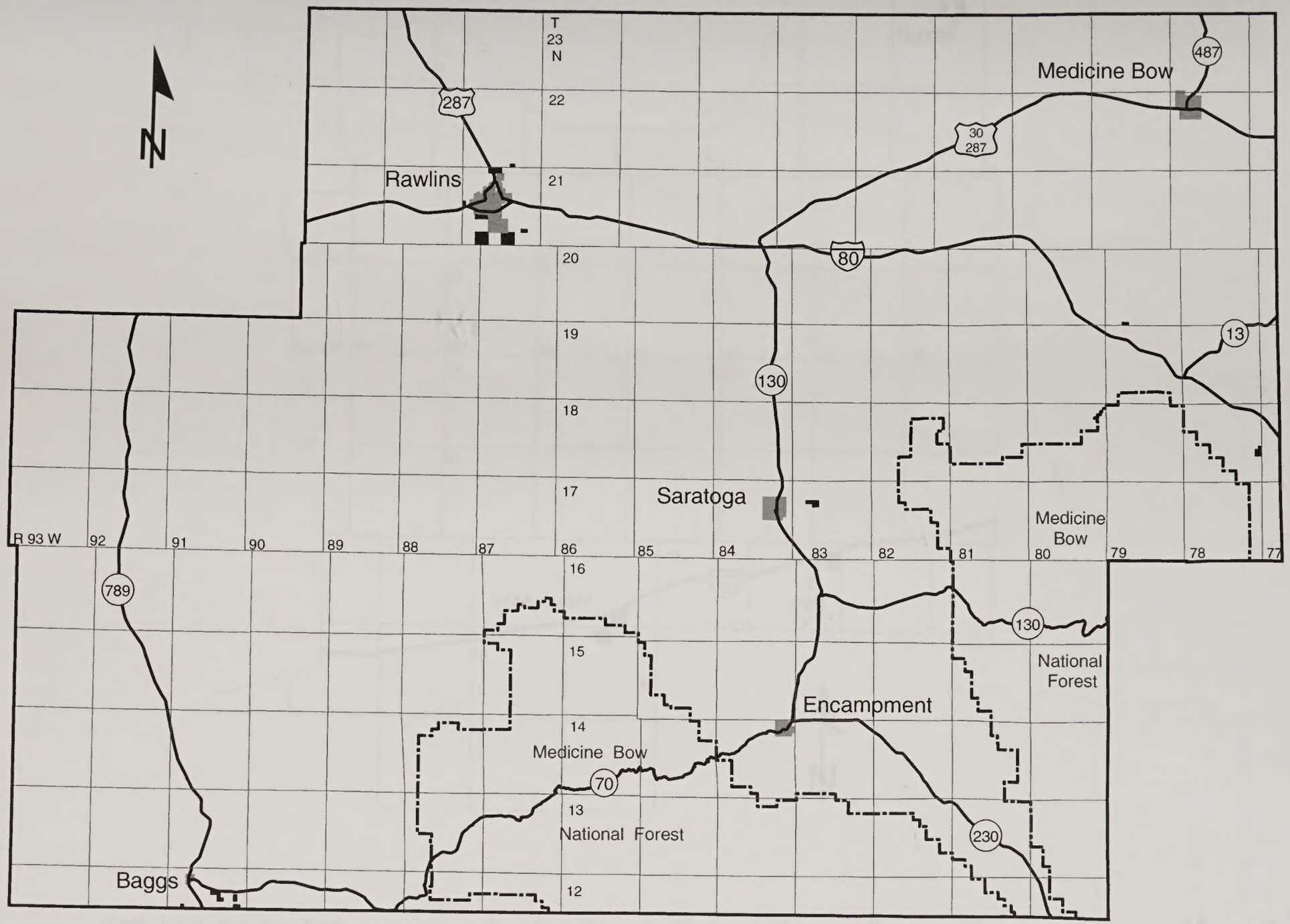
0 5 10 20 30 40 50
Kilometers

0 2.5 5 10 15 20 25
Miles

Map 2-25
Potential Disposals - Albany County
Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Public lands that may have potential for disposal or transfer

0 5 10 20 30 40 50
Kilometers

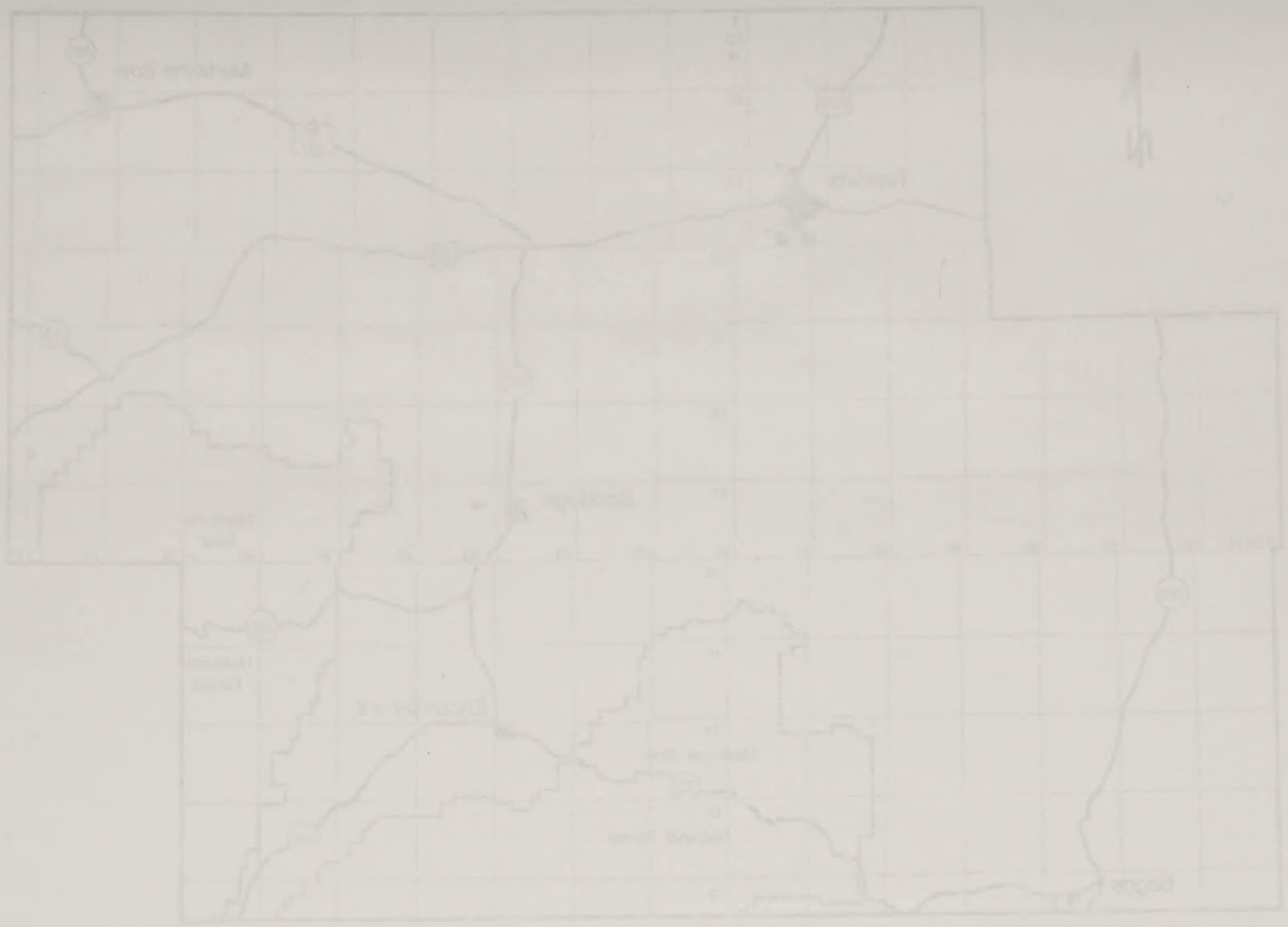
0 2.5 5 10 15 20 25
Miles

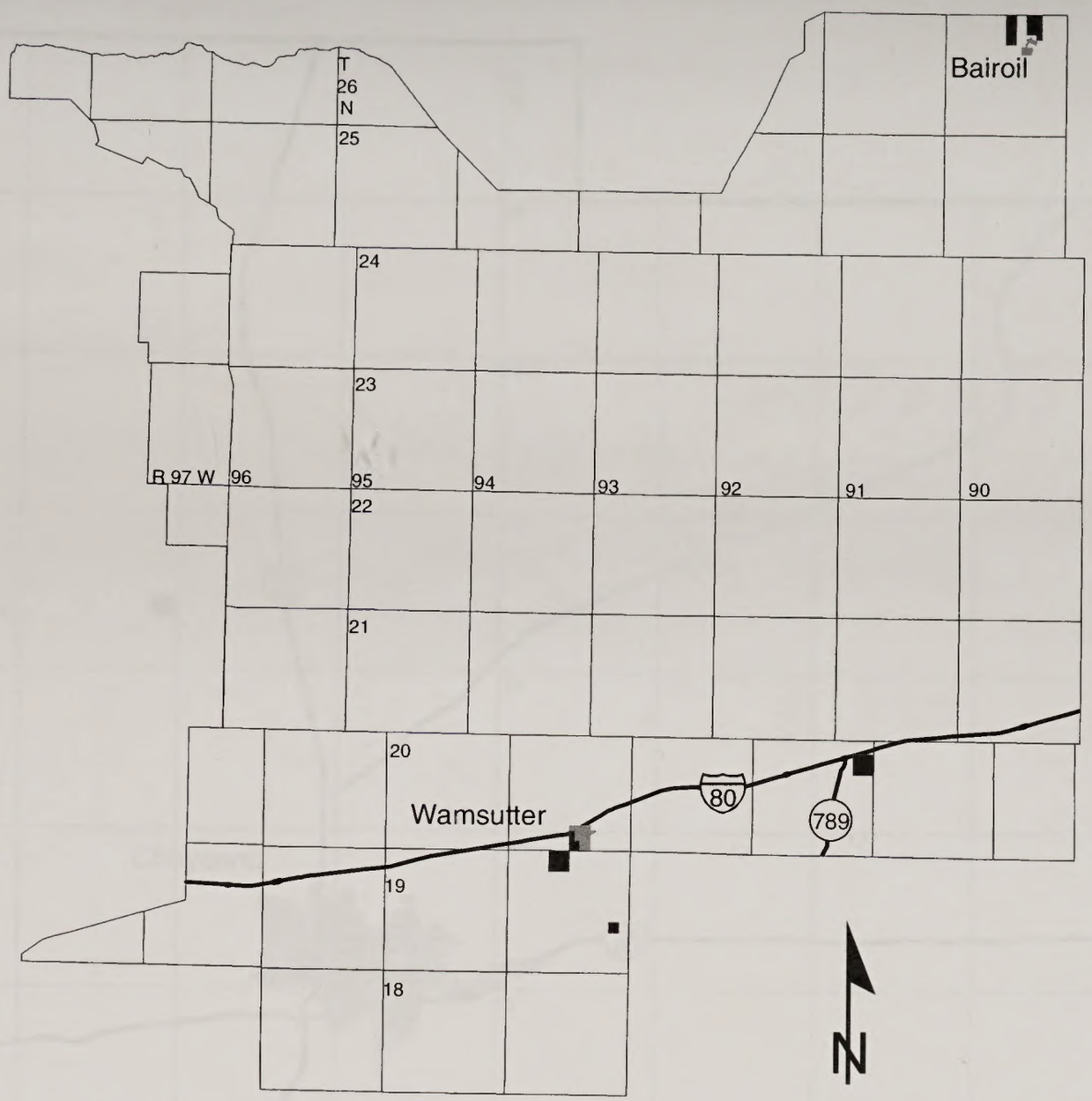
Map 2-26

Potential Disposals - Carbon County

Alternatives 2 & 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Public lands that may have potential for disposal or transfer

0 5 10 20 30 40 50
Kilometers

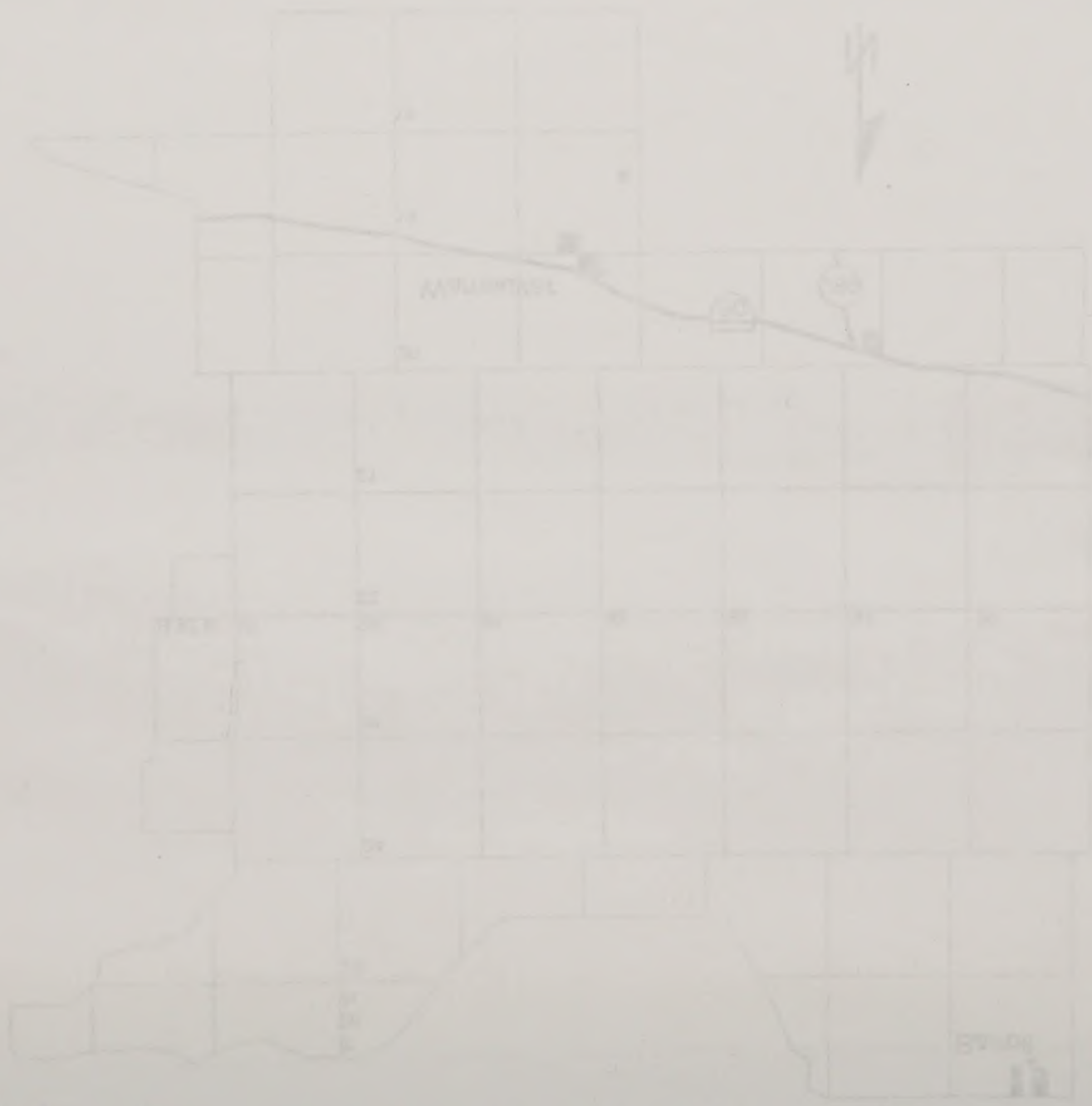
0 2.5 5 10 15 20 25
Miles

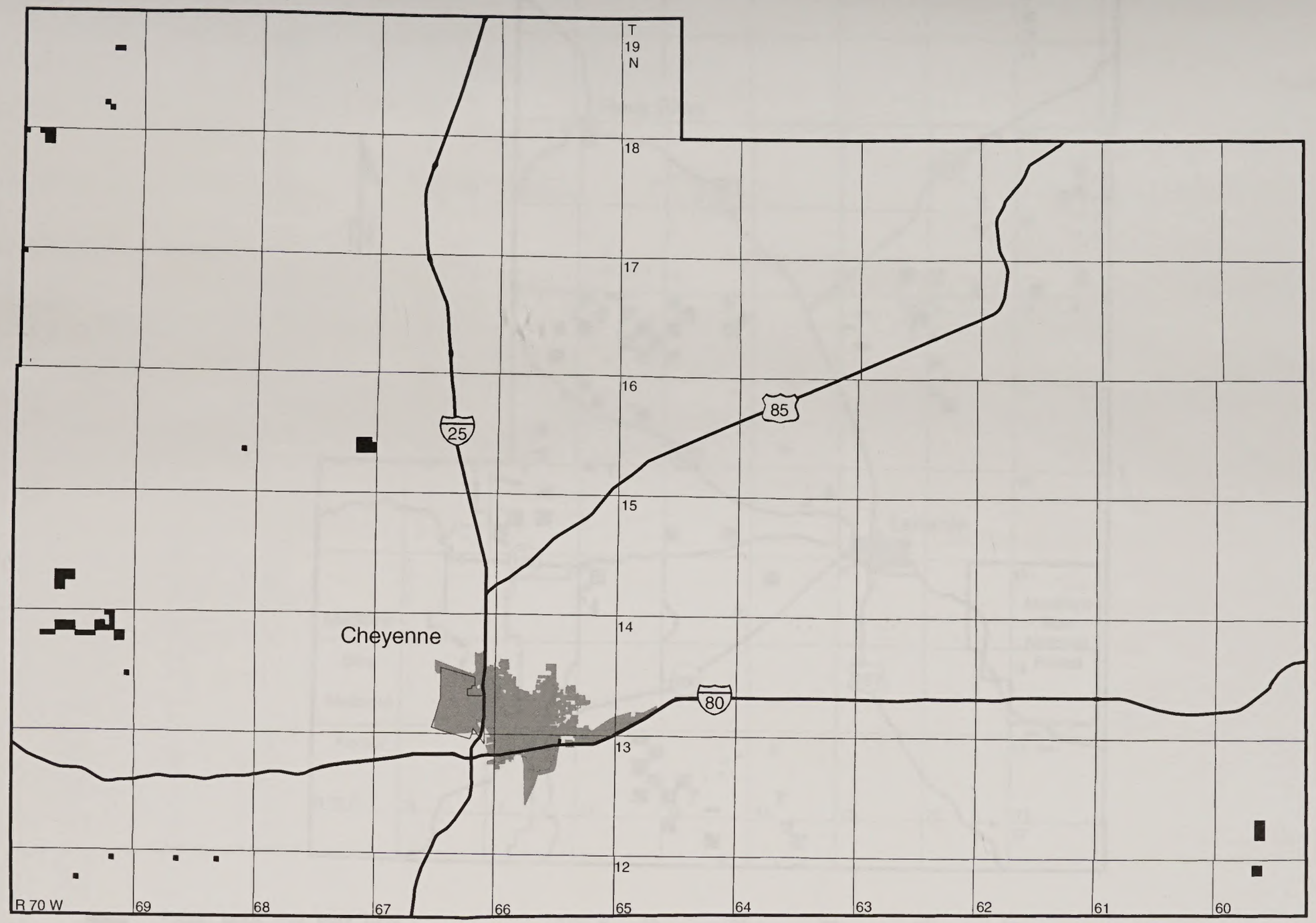
Map 2-27

Potential Disposals - Sweetwater County

Alternatives 2 & 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Public lands that may have potential for disposal or transfer

0 5 10 20 30 40 50
Kilometers

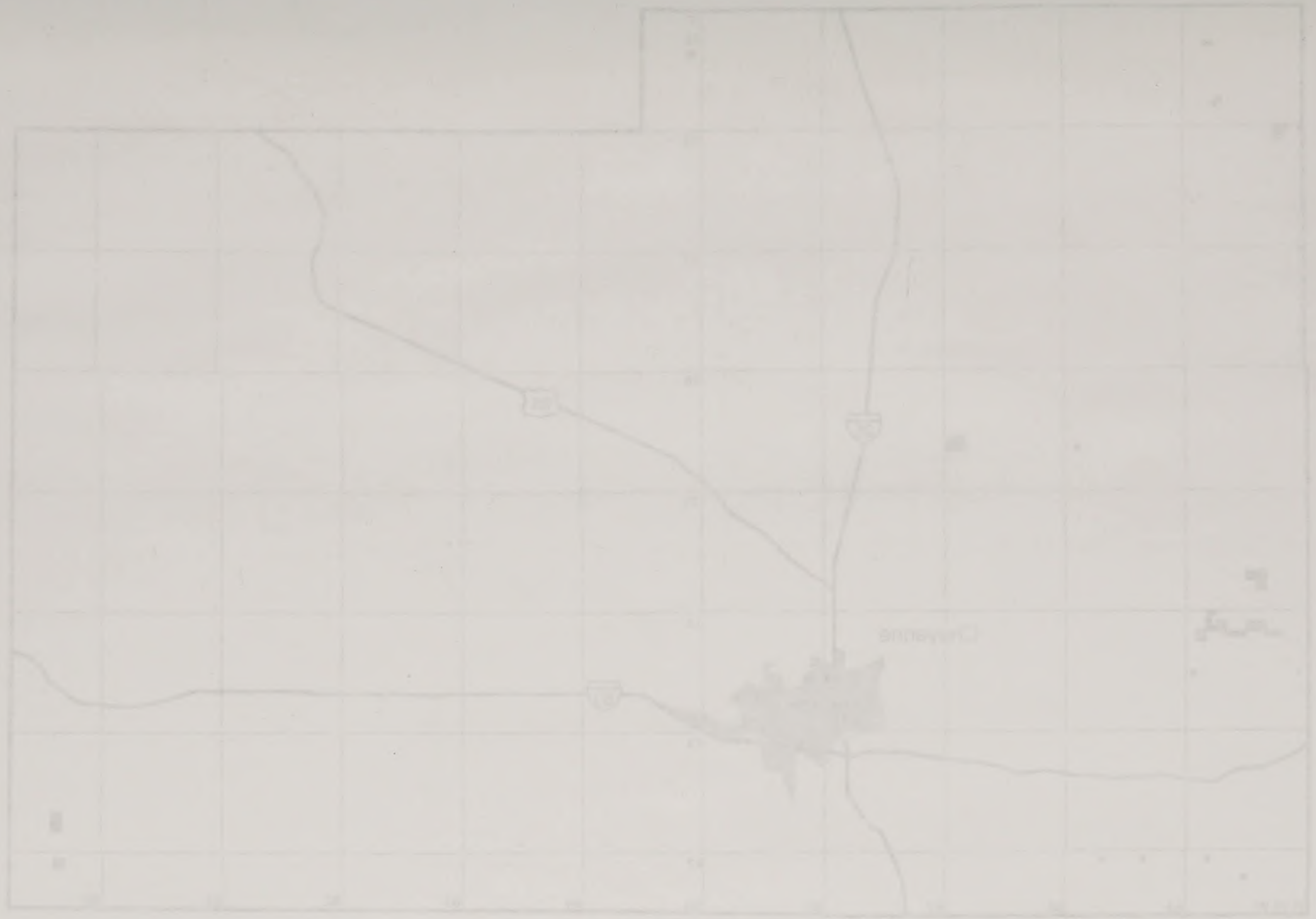
0 2.5 5 10 15 20 25
Miles

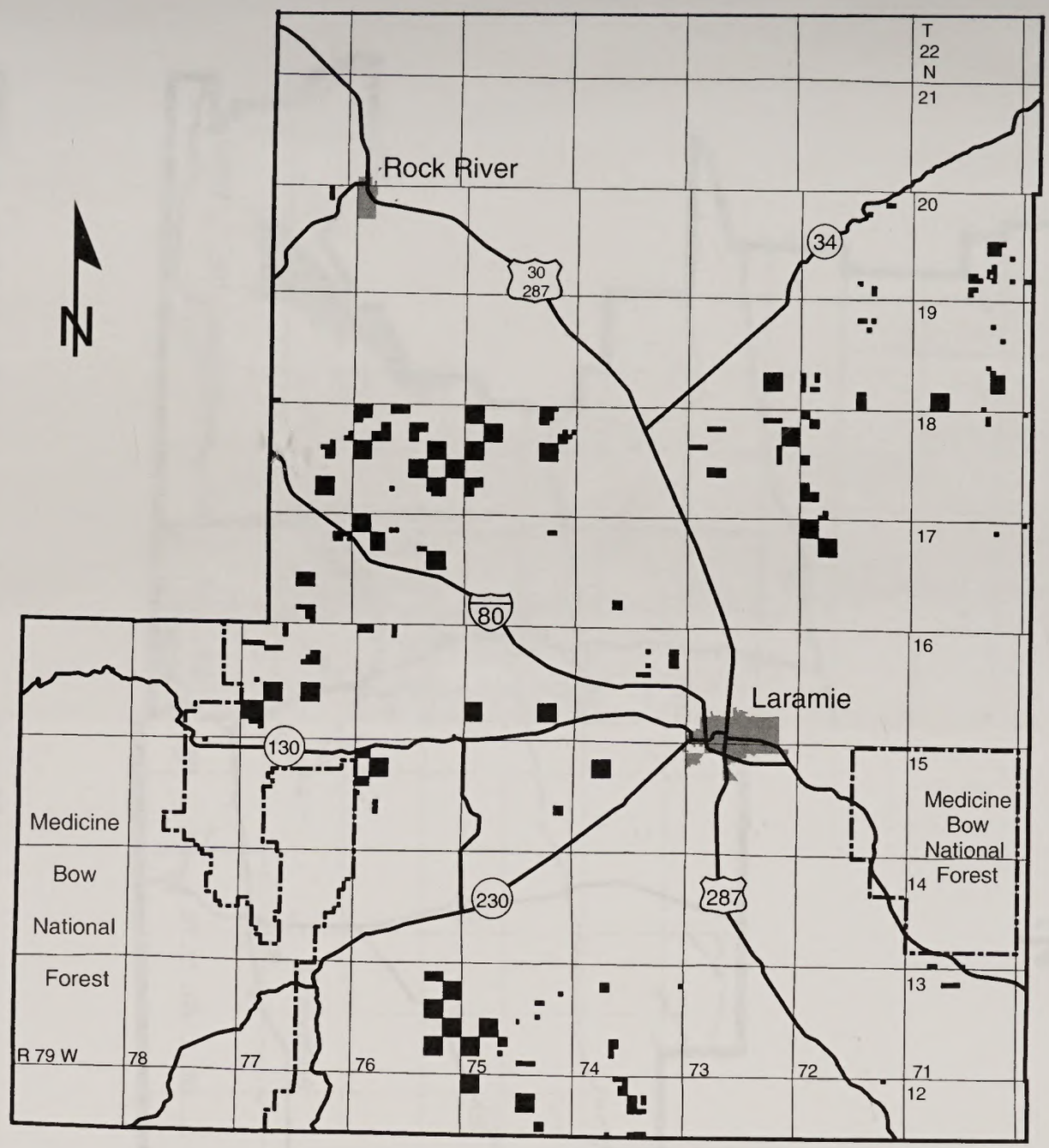
Map 2-28

Potential Disposals - Laramie County

Alternatives 2 & 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Public lands that may have potential for disposal or transfer

0 5 10 20 30 40 50
Kilometers

0 2.5 5 10 15 20 25
Miles

Map 2-29

Potential Disposals - Albany County

Alternatives 2 & 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Avoidance Areas

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

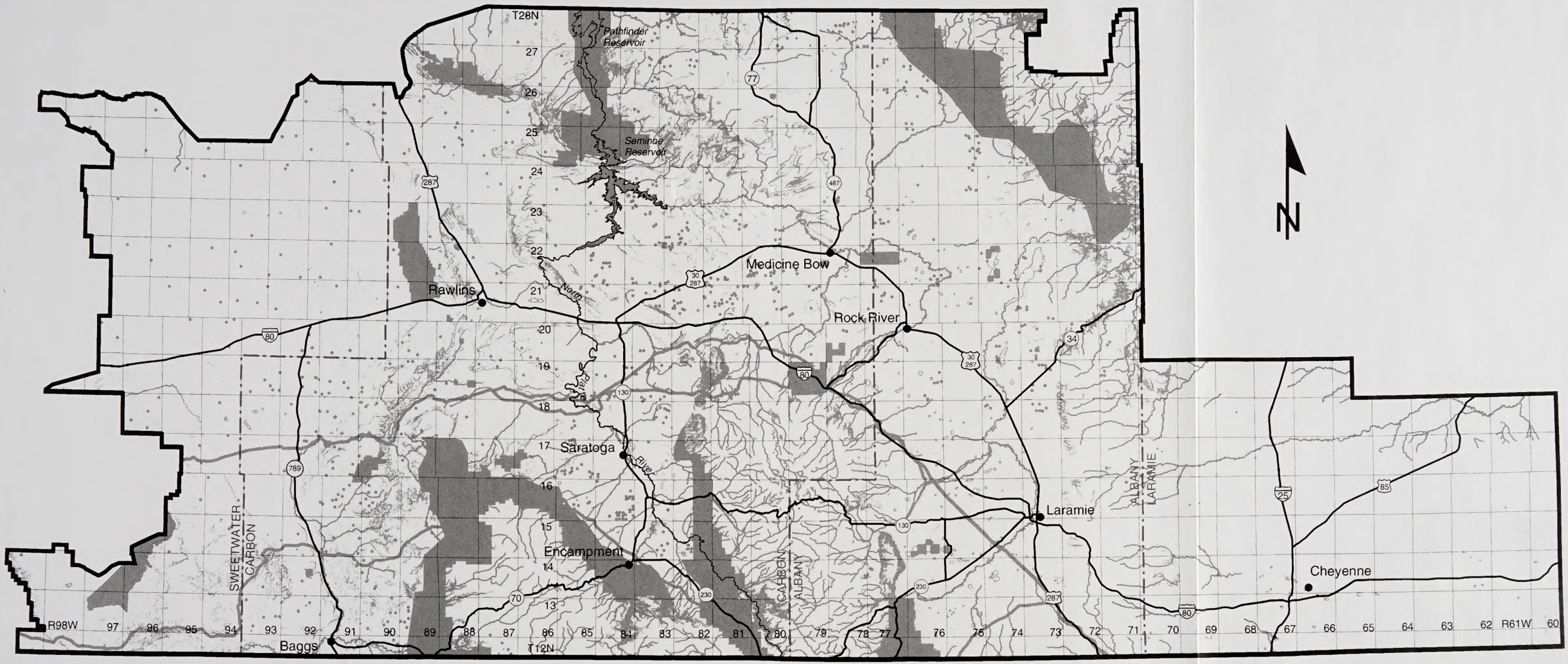
Map 2-30

Utility/Transportation Systems Avoidance Areas

Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Avoidance Areas

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

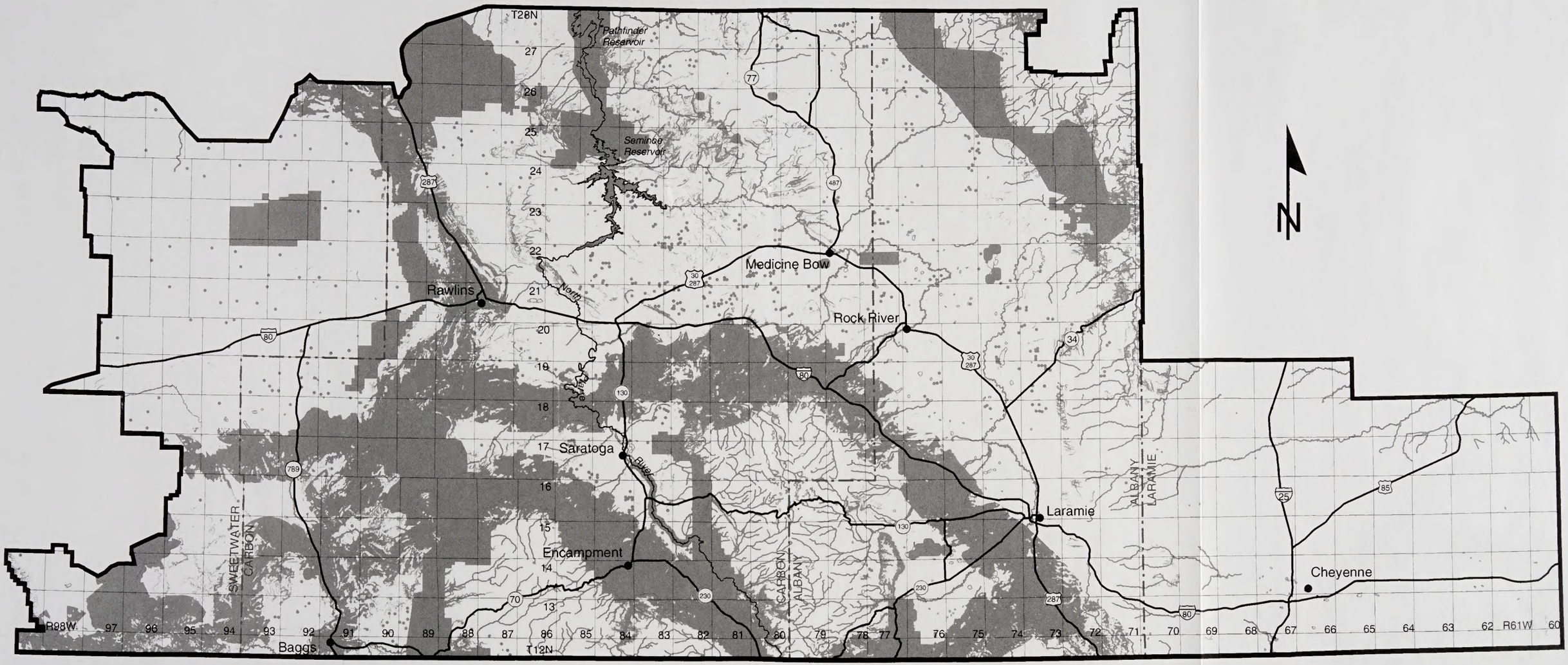
Map 2-31

Utility/Transportation Systems Avoidance Areas

Alternative 2

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Avoidance Areas

0 10 20 40 60 80 100
Kilometers

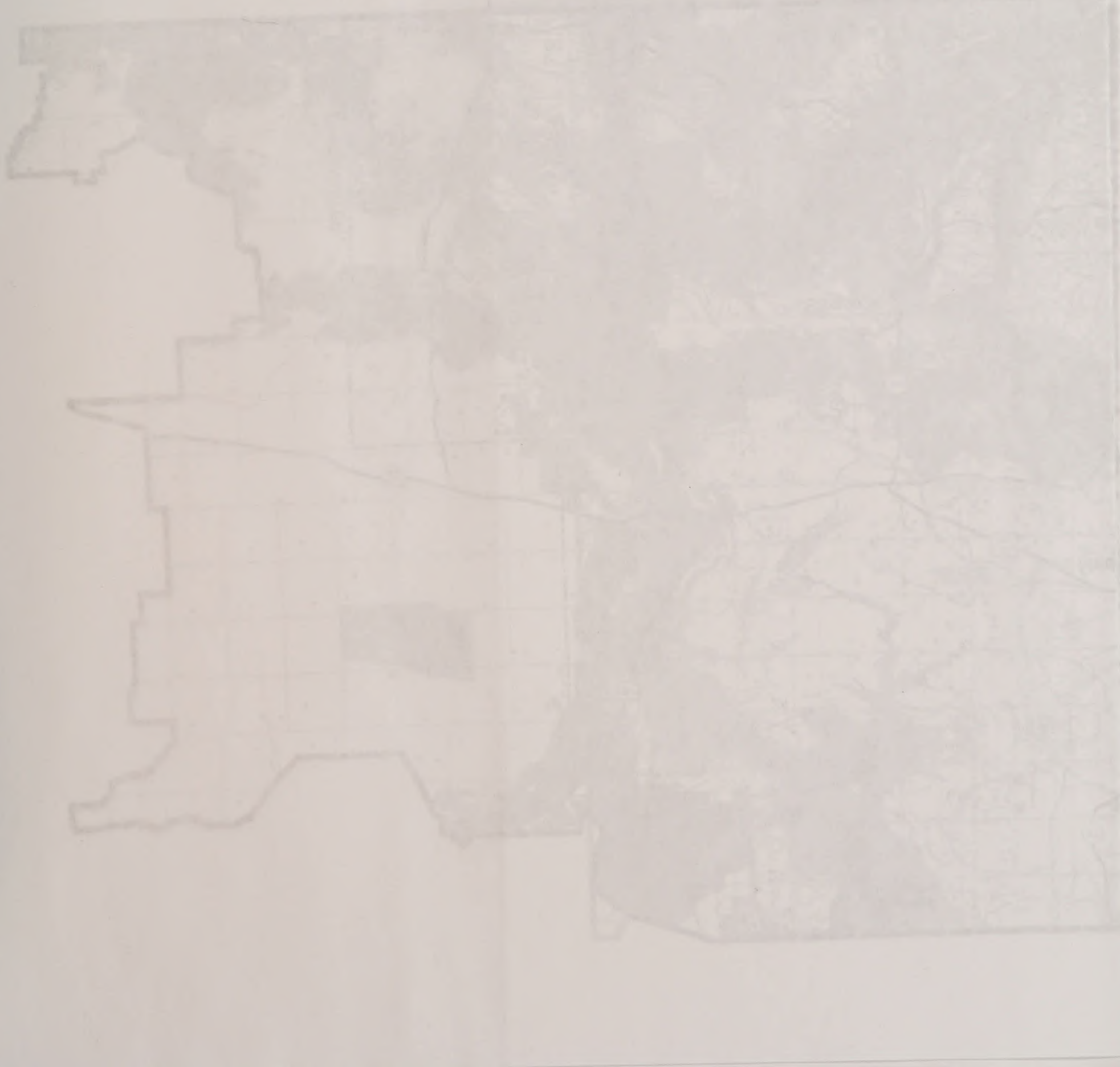
0 5 10 20 30 40 50
Miles

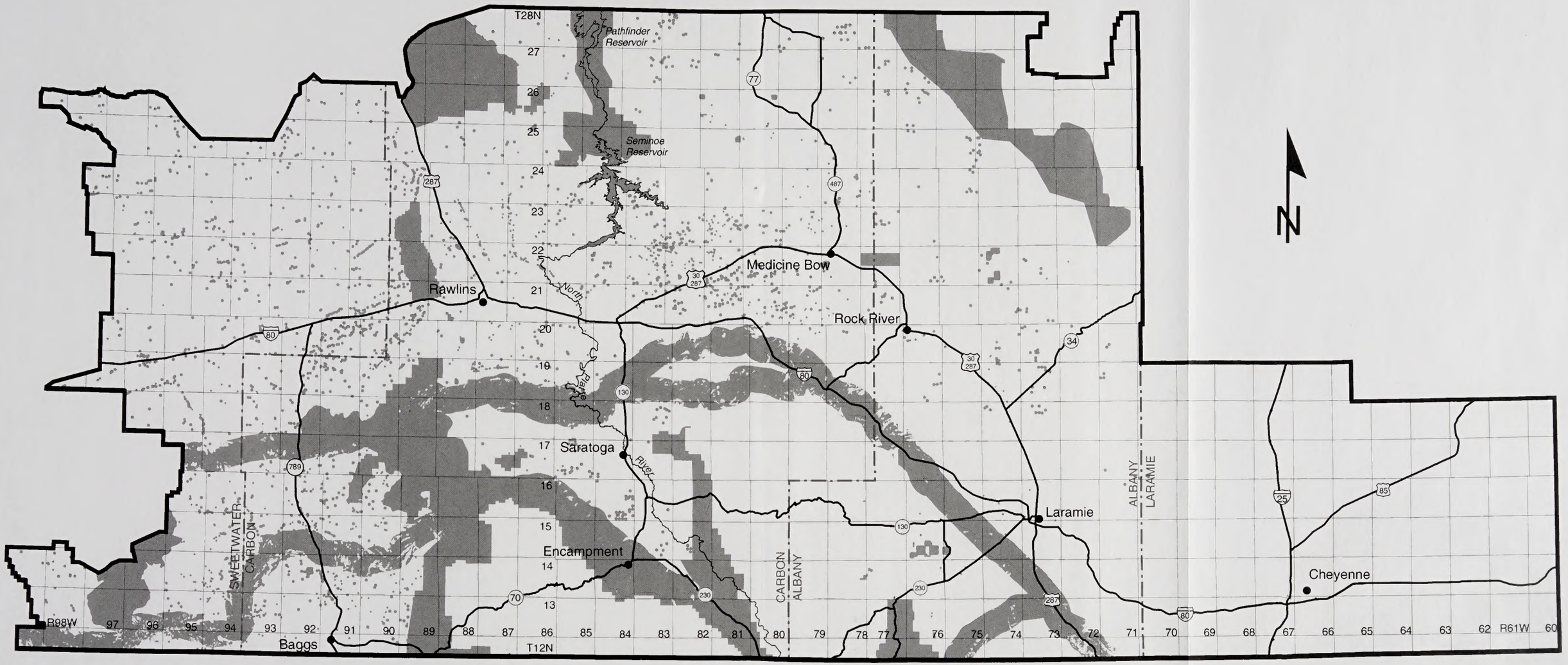
Map 2-32

Utility/Transportation Systems Avoidance Areas

Alternative 3

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Avoidance Areas

0 10 20 40 60 80 100
Kilometers

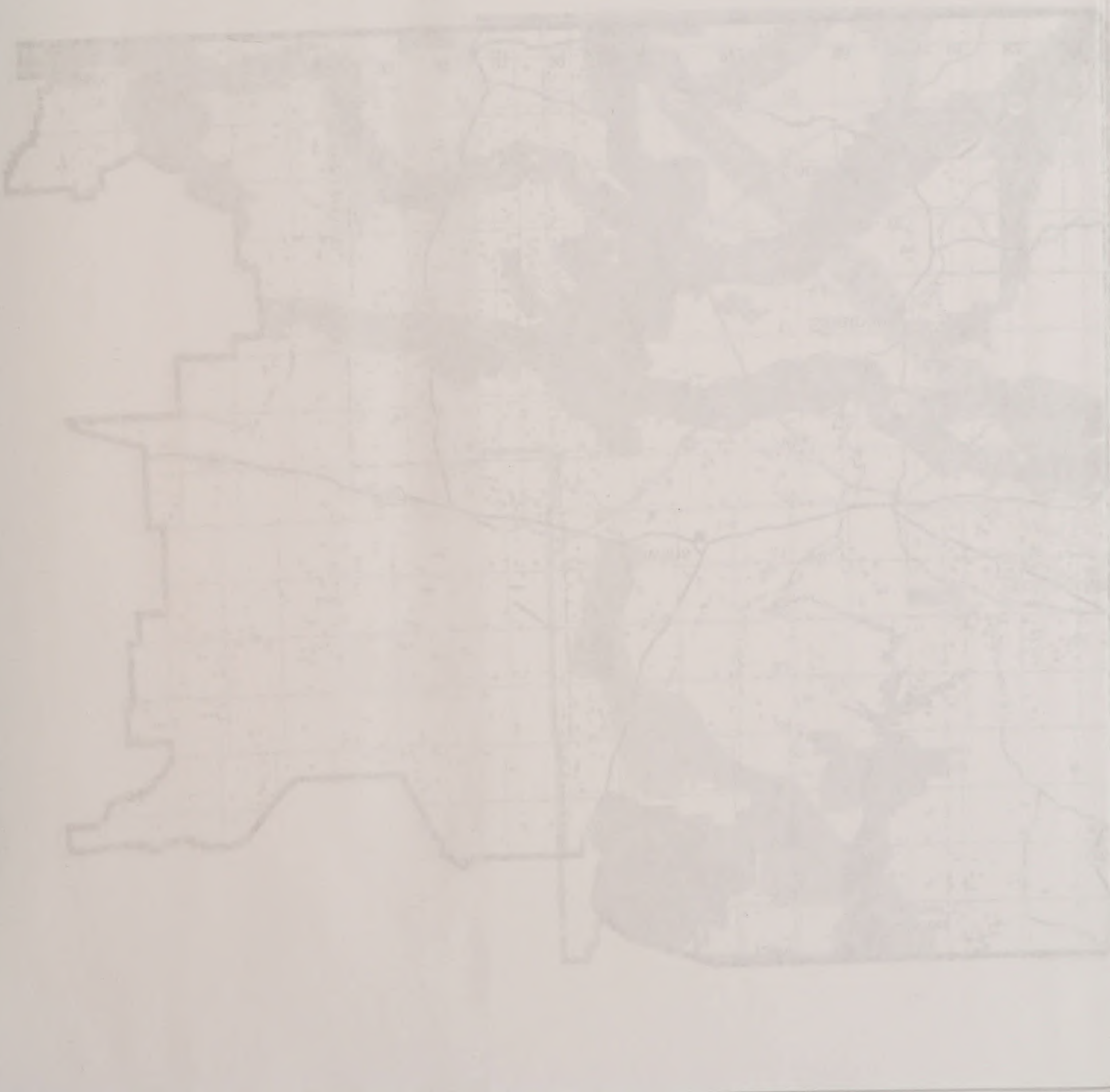
0 5 10 20 30 40 50
Miles

Map 2-33

Utility/Transportation Systems Avoidance Areas

Alternative 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Excluded from conversion to bison grazing

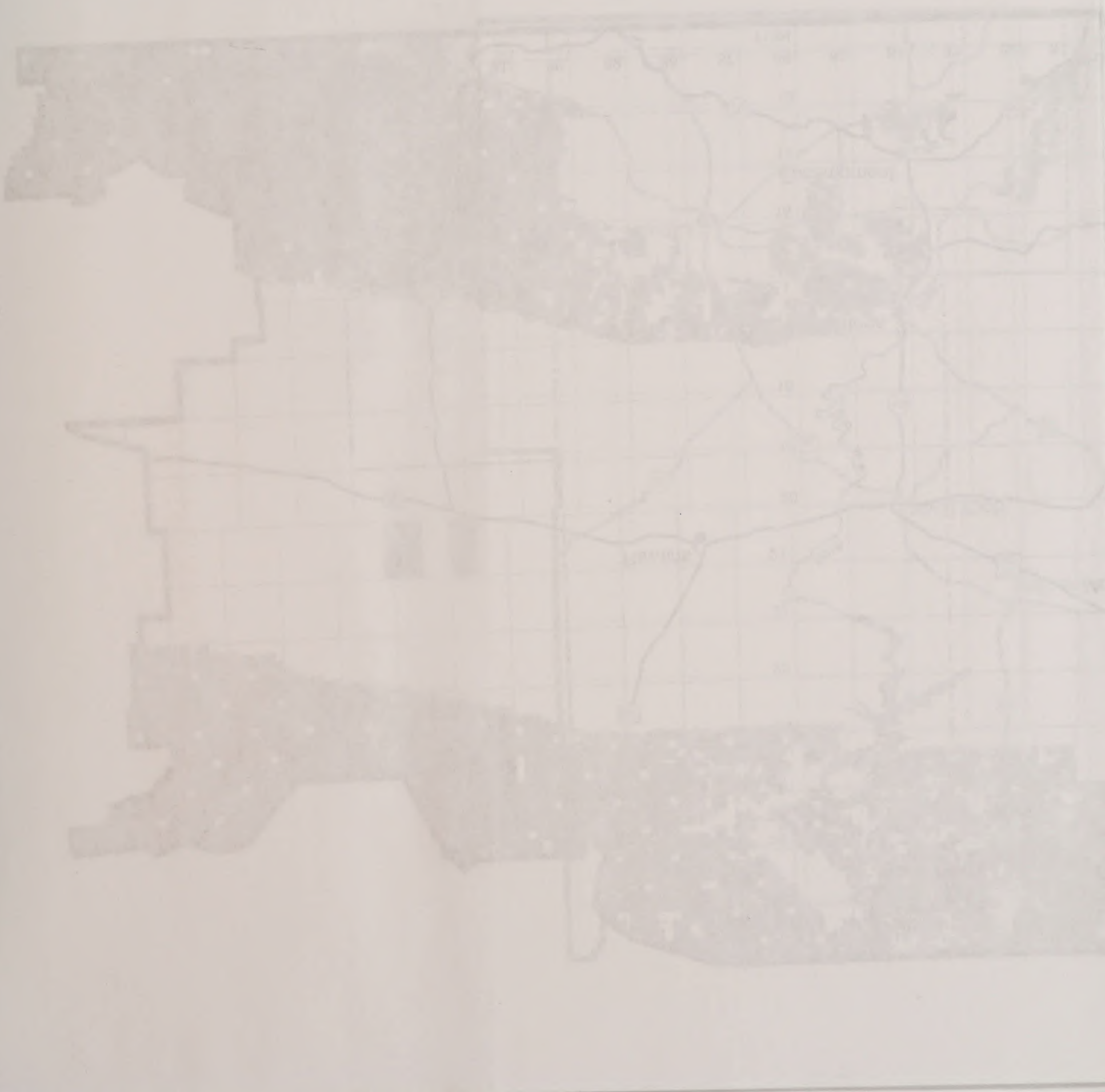
0 10 20 40 60 80 100
Kilometers

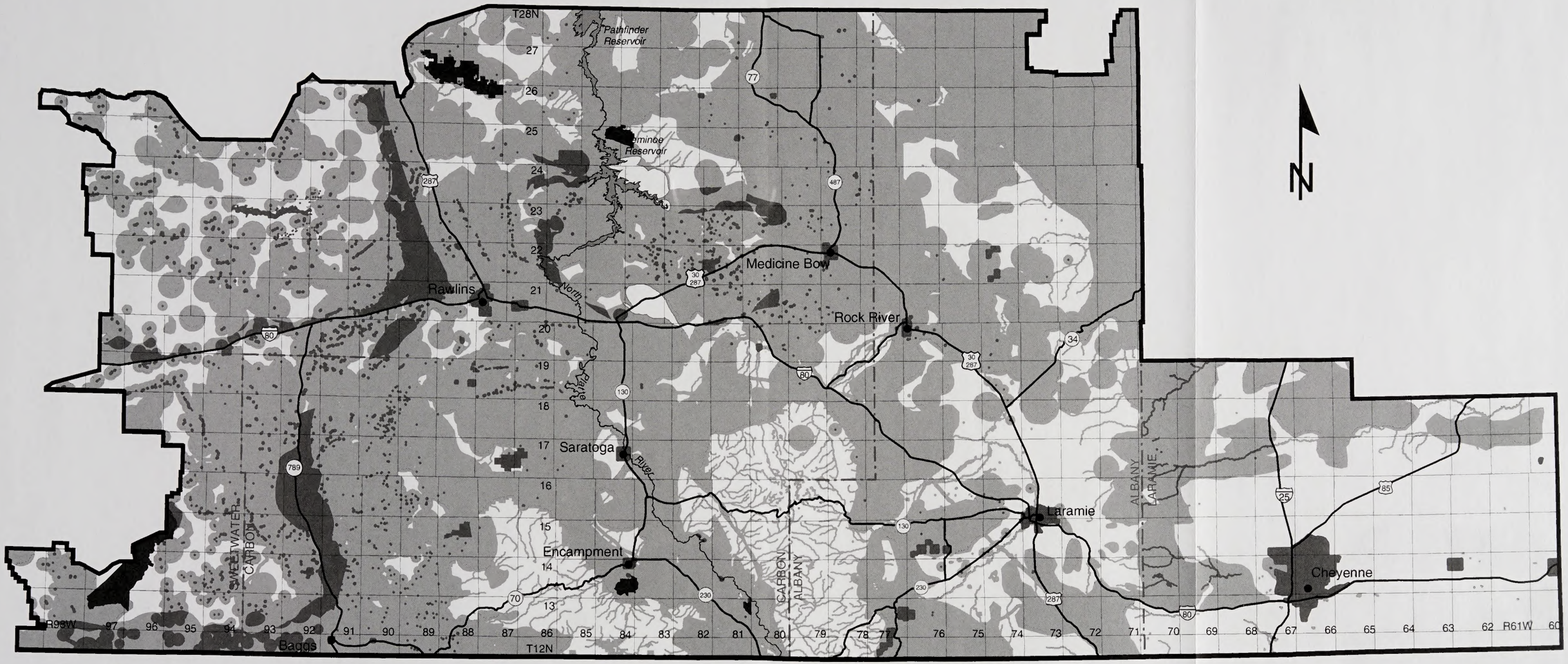
0 5 10 20 30 40 50
Miles

Map 2-34

Bison Exclusion Areas

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





- Classification A - Open to Leasing with Standard Stipulations
- Classification B - Open to Leasing with Minor Constraints
- Classification C - Open to Leasing with Major Constraints
- Classification D - Closed to Leasing

(See Table 2-1 for additional information)

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM

0 10 20 40 60 80 100
Kilometers

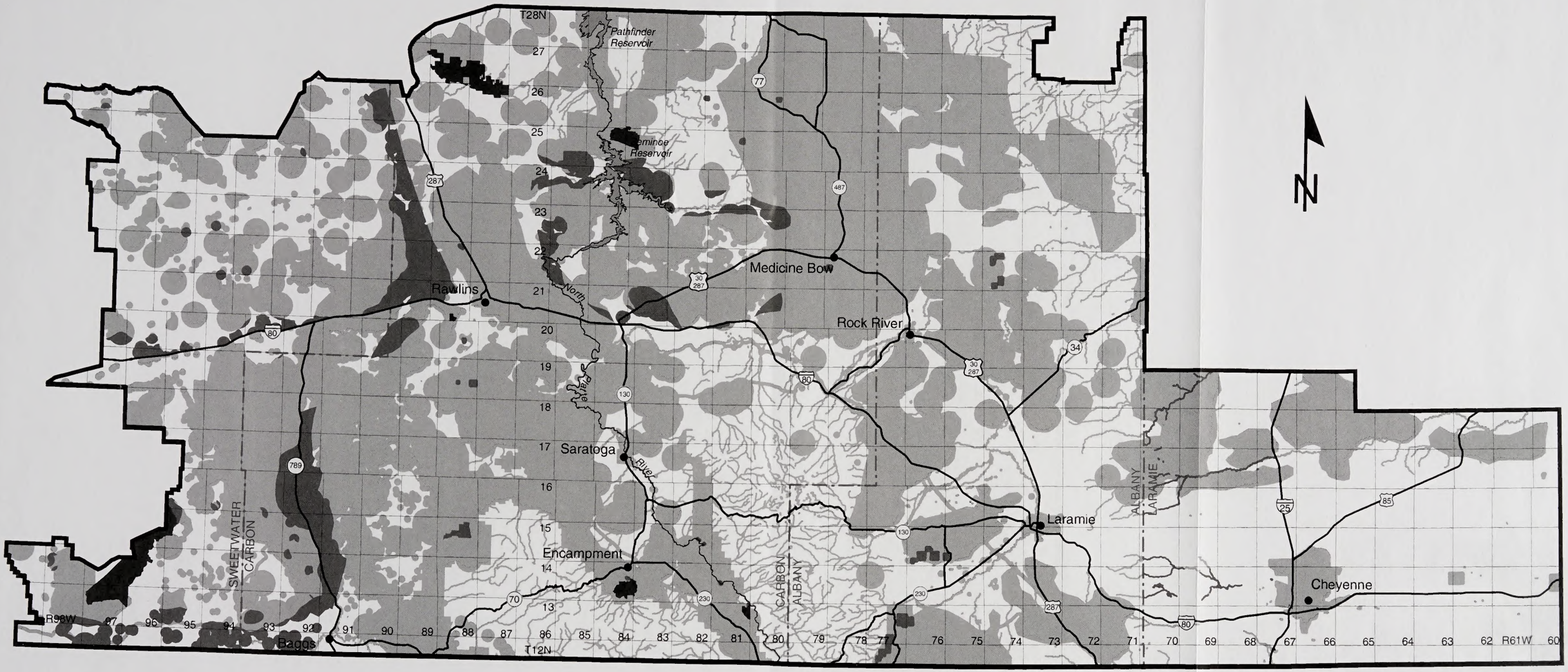
0 5 10 20 30 40 50
Miles

Map 2-35

Oil and Gas Classifications

Alternative 1





Classification A - Open to Leasing with Standard Stipulations

Classification B - Open to Leasing with Minor Constraints

Classification C - Open to Leasing with Major Constraints

Classification D - Closed to Leasing

(See Table 2-1 for additional information)

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

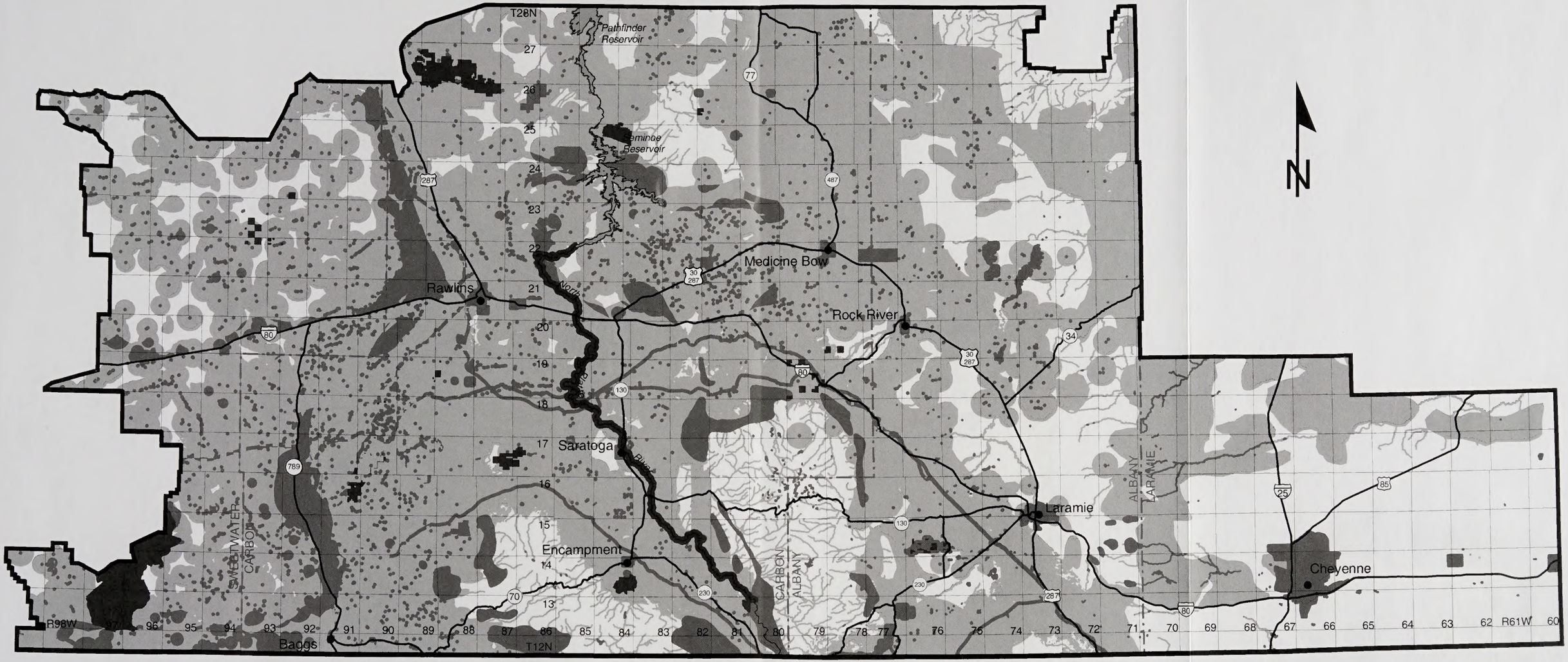
Map 2-36

Oil and Gas Classifications

Alternative 2

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Classification A - Open to Leasing with Standard Stipulations

Classification B - Open to Leasing with Minor Constraints

Classification C - Open to Leasing with Major Constraints

Classification D - Closed to Leasing

(See Table 2-1 for additional information)

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

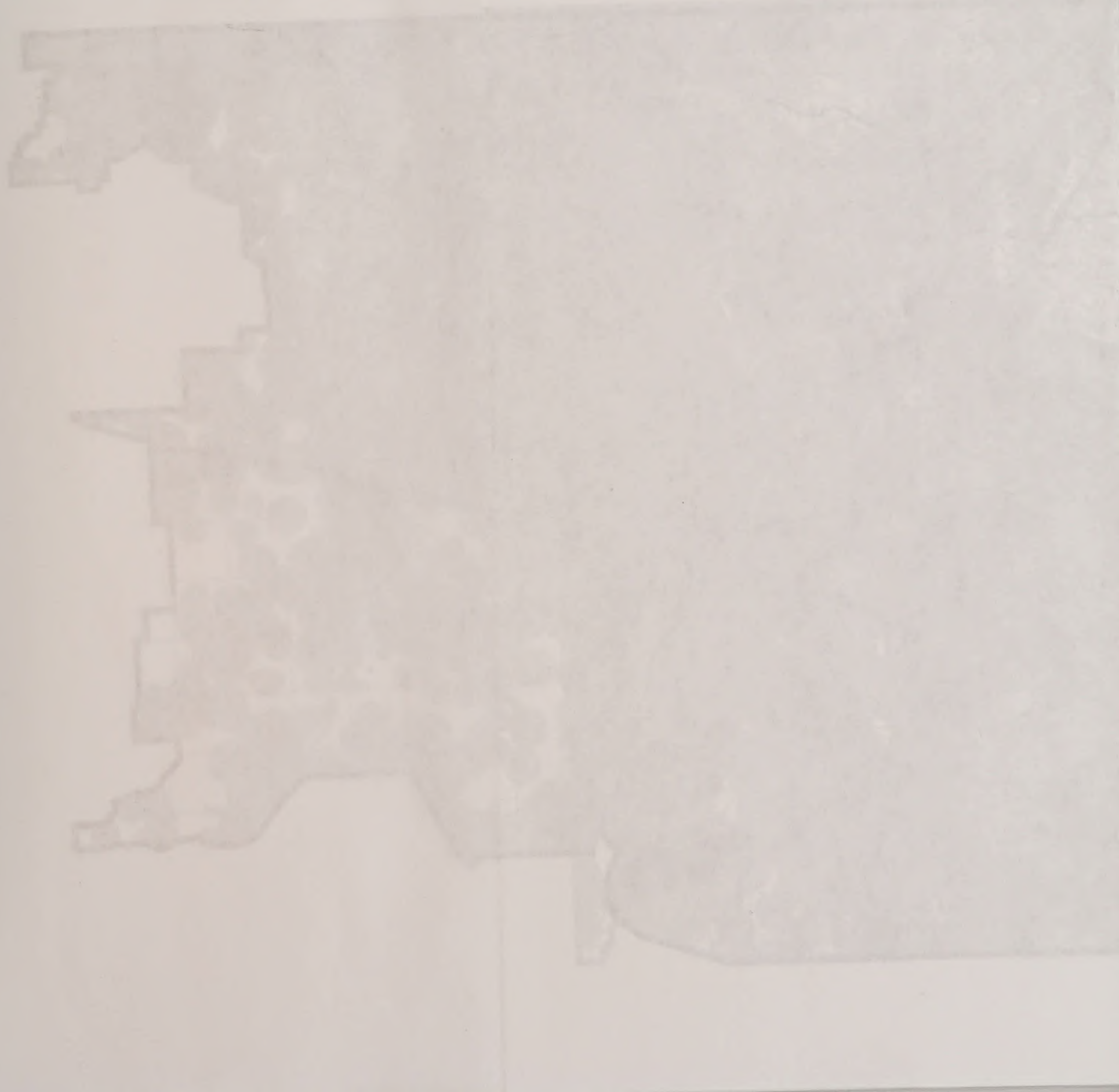
Miles

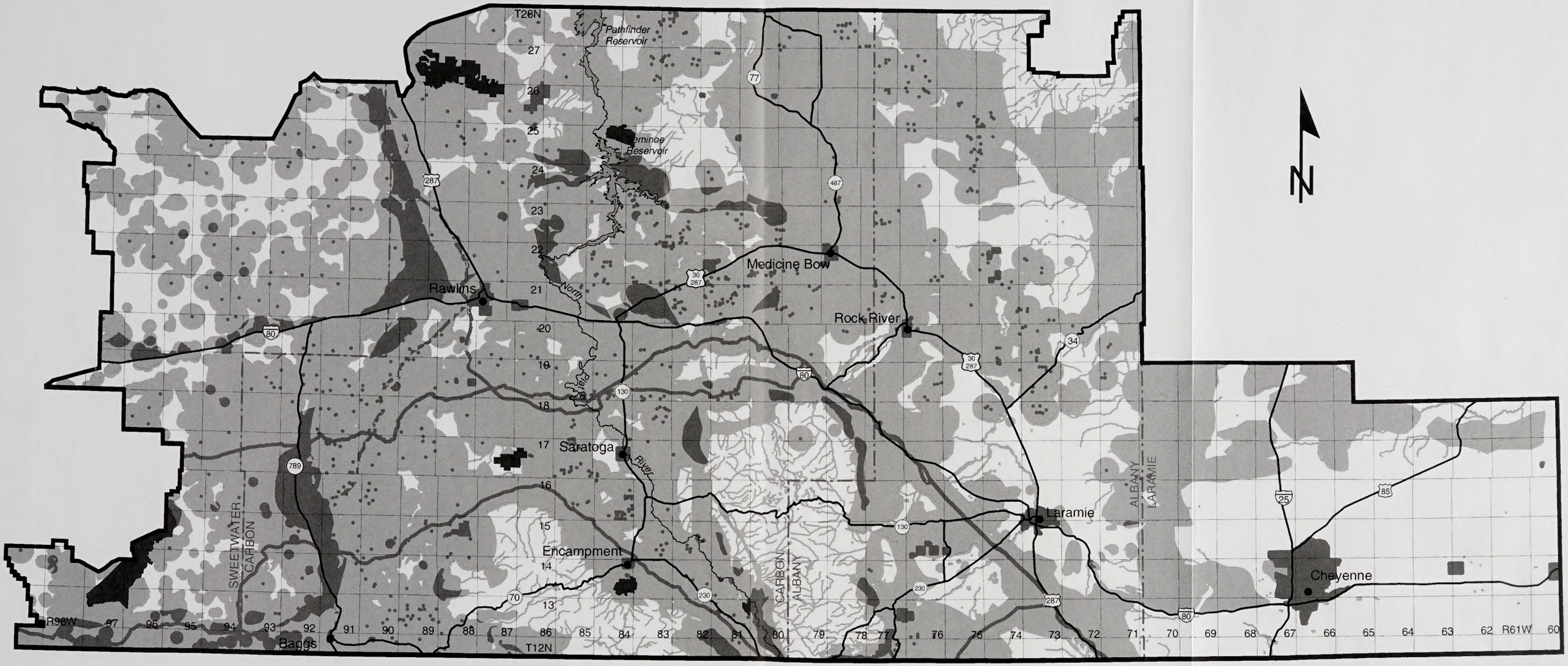
Map 2-37

Oil and Gas Classifications

Alternative 3

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Classification A - Open to Leasing with Standard Stipulations

Classification B - Open to Leasing with Minor Constraints

Classification C - Open to Leasing with Major Constraints

Classification D - Closed to Leasing

(See Table 2-1 for additional information)

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

Miles

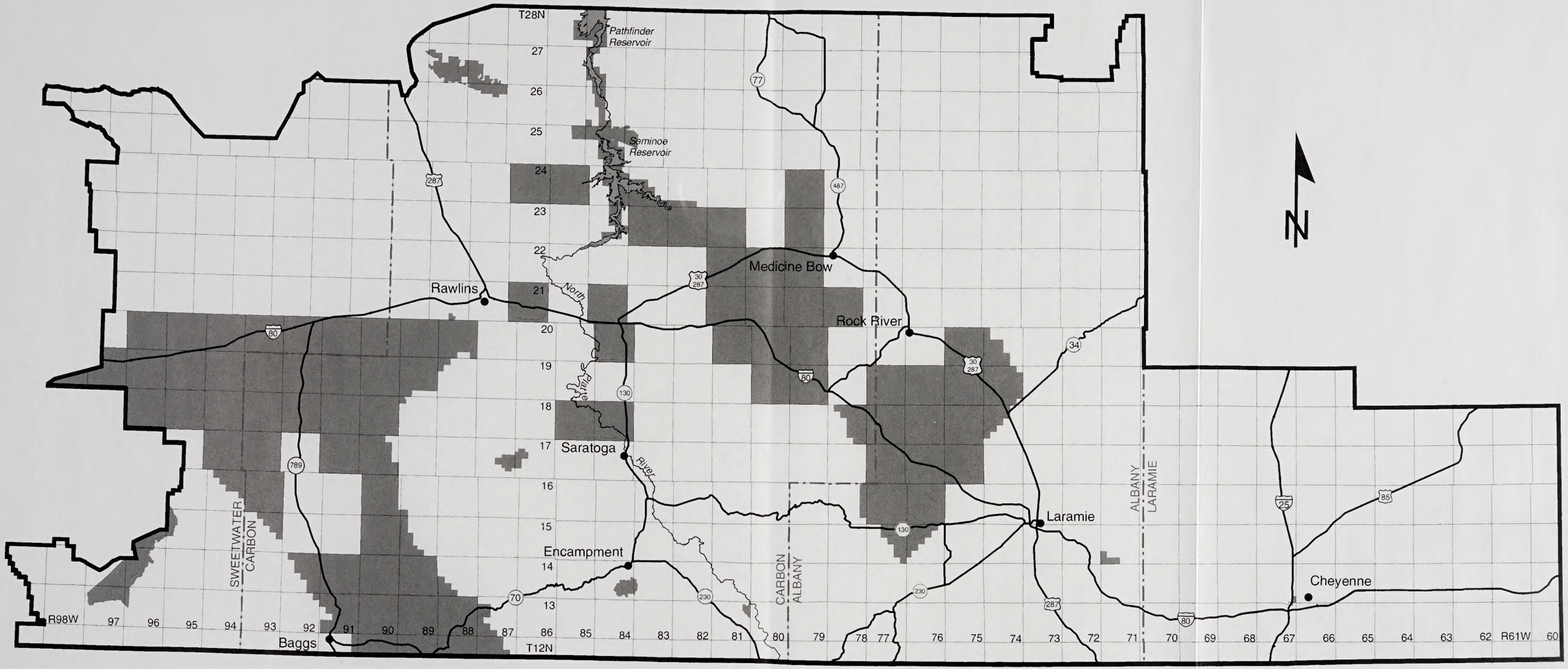
Map 2-38

Oil and Gas Classifications

Alternative 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Withdrawn from Locatable Mineral Entry

0 10 20 40 60 80 100
Kilometers

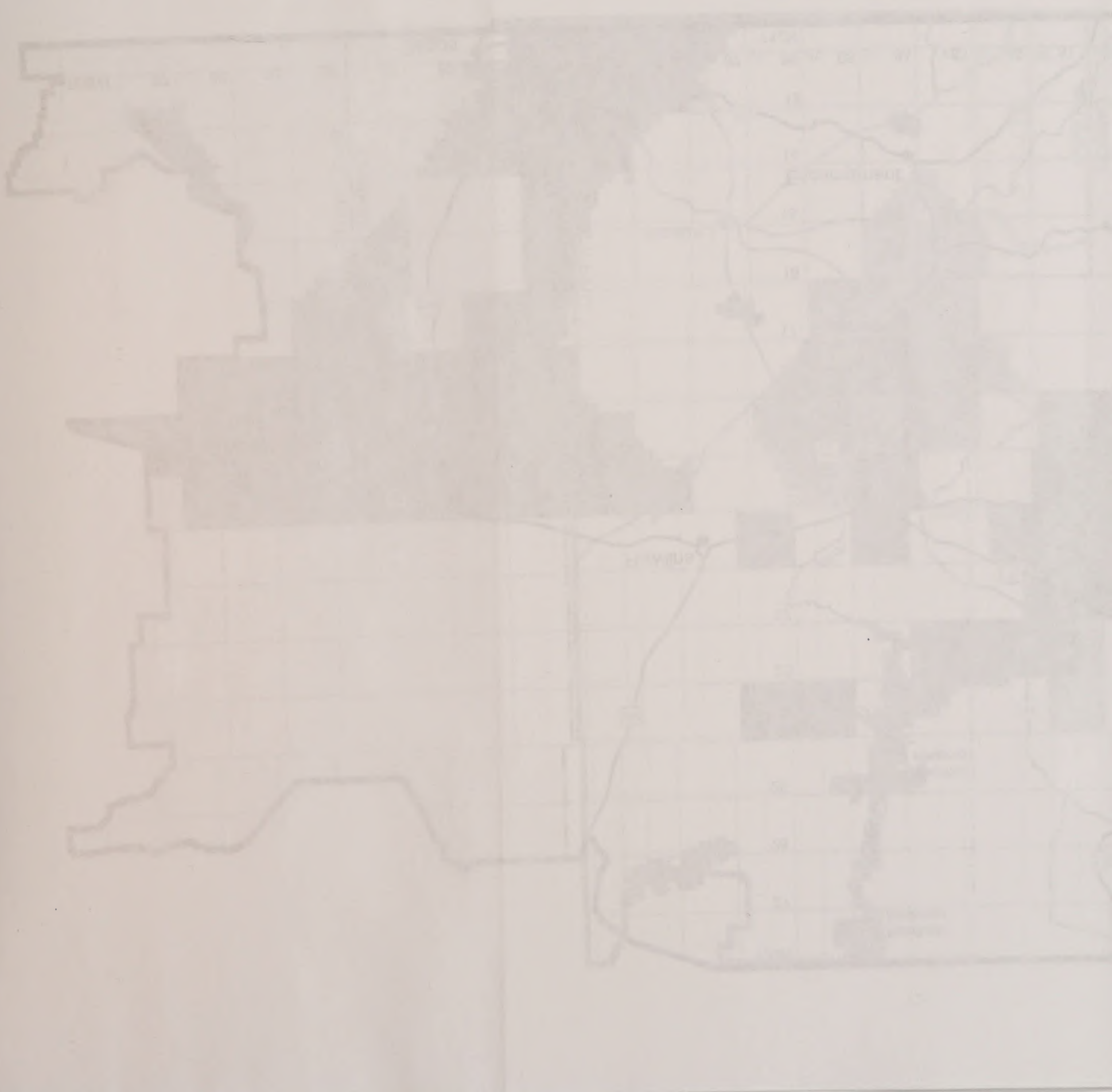
0 5 10 20 30 40 50
Miles

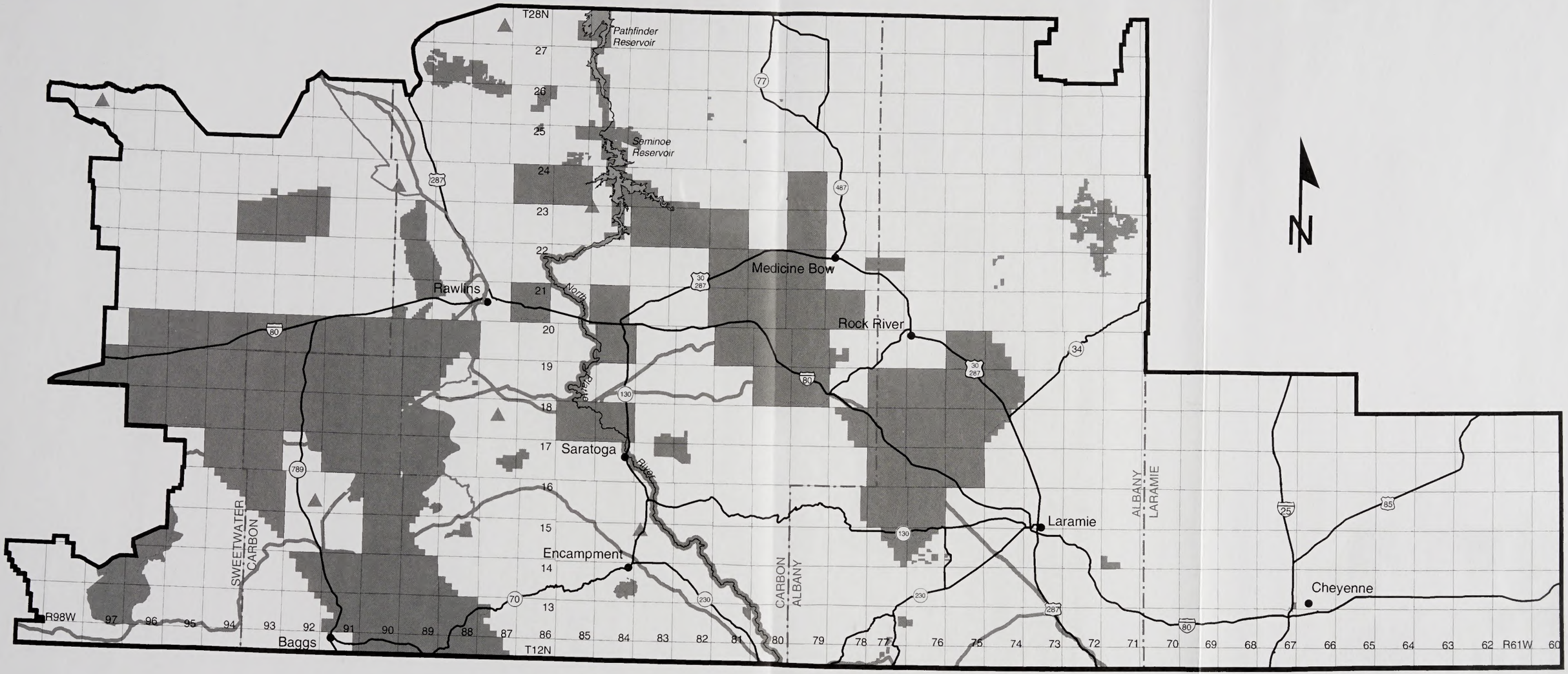
Map 2-39

Locatable Mineral Withdrawals

Alternative 2

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Withdrawn from Locatable Mineral Entry

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

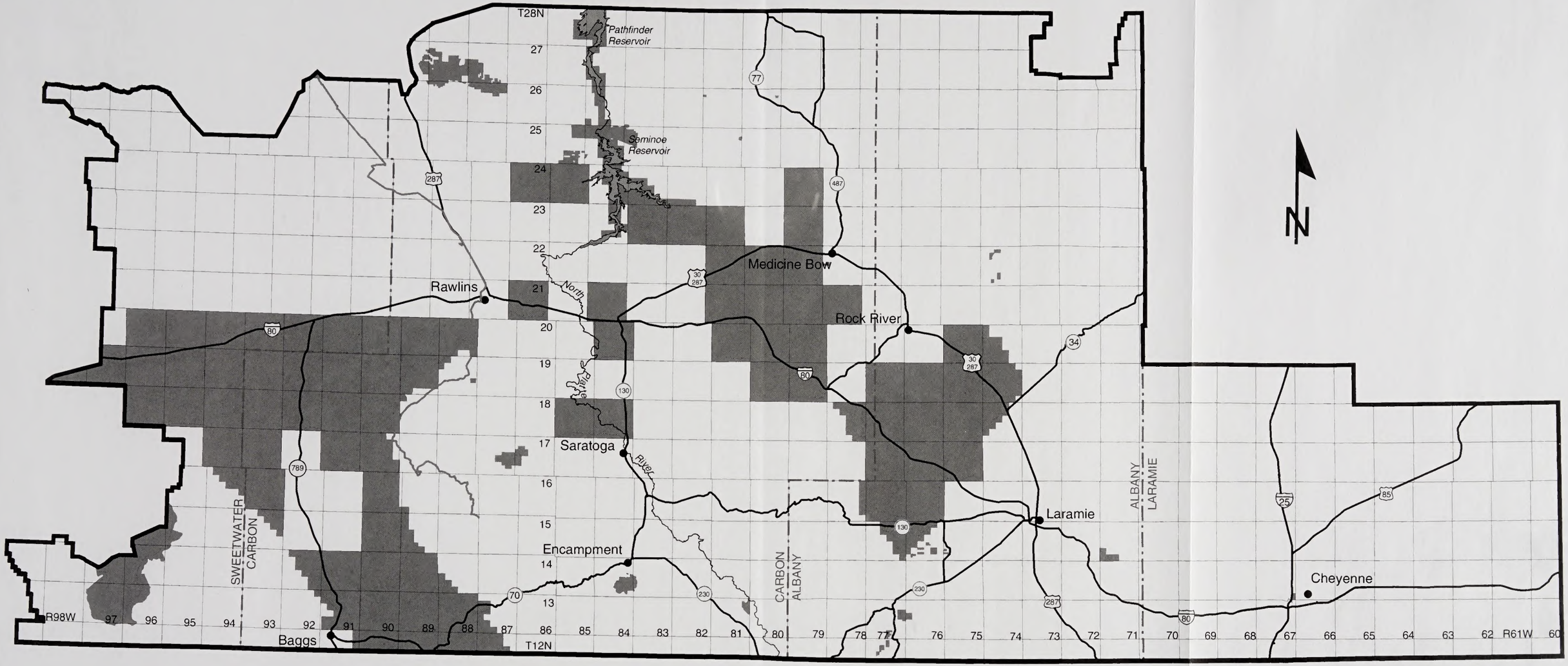
Map 2-40

Locatable Mineral Withdrawals

Alternative 3

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Withdrawn from Locatable Mineral Entry

0 10 20 40 60 80 100
Kilometers

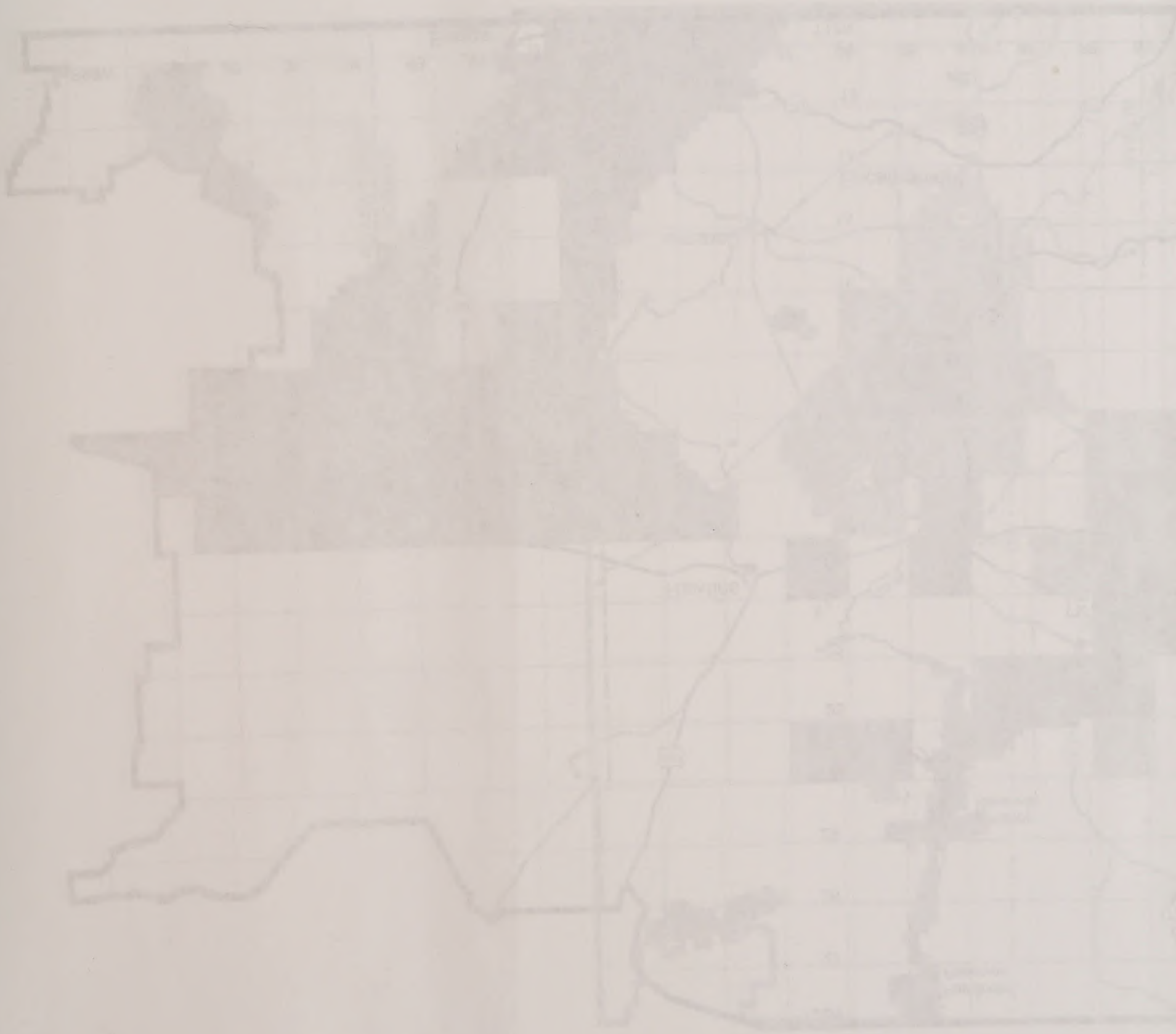
0 5 10 20 30 40 50
Miles

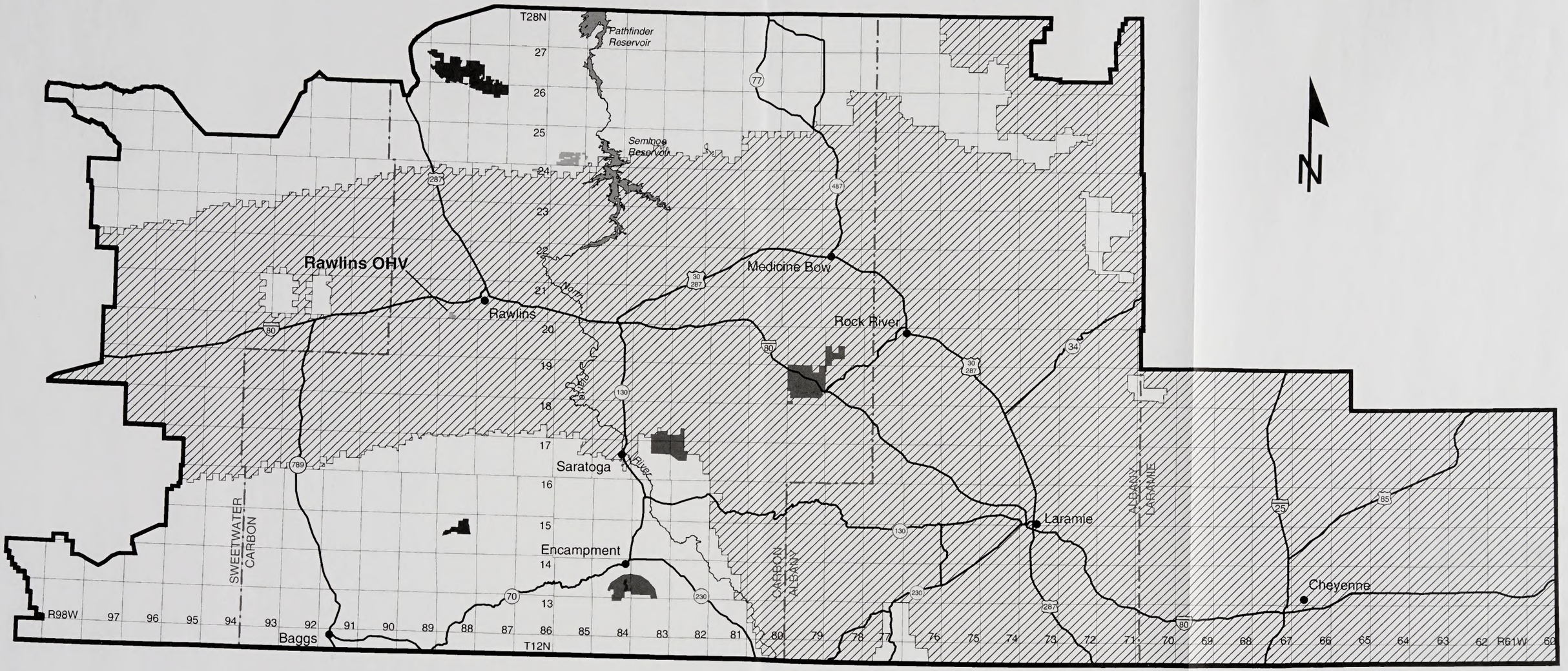
Map 2-41

Locatable Mineral Withdrawals

Alternative 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Open

Closed

Limited - Seasonal Closure

Limited - Existing Roads and Vehicle Routes

Limited - Designated Roads and Trails/Existing Roads and Vehicle Routes

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

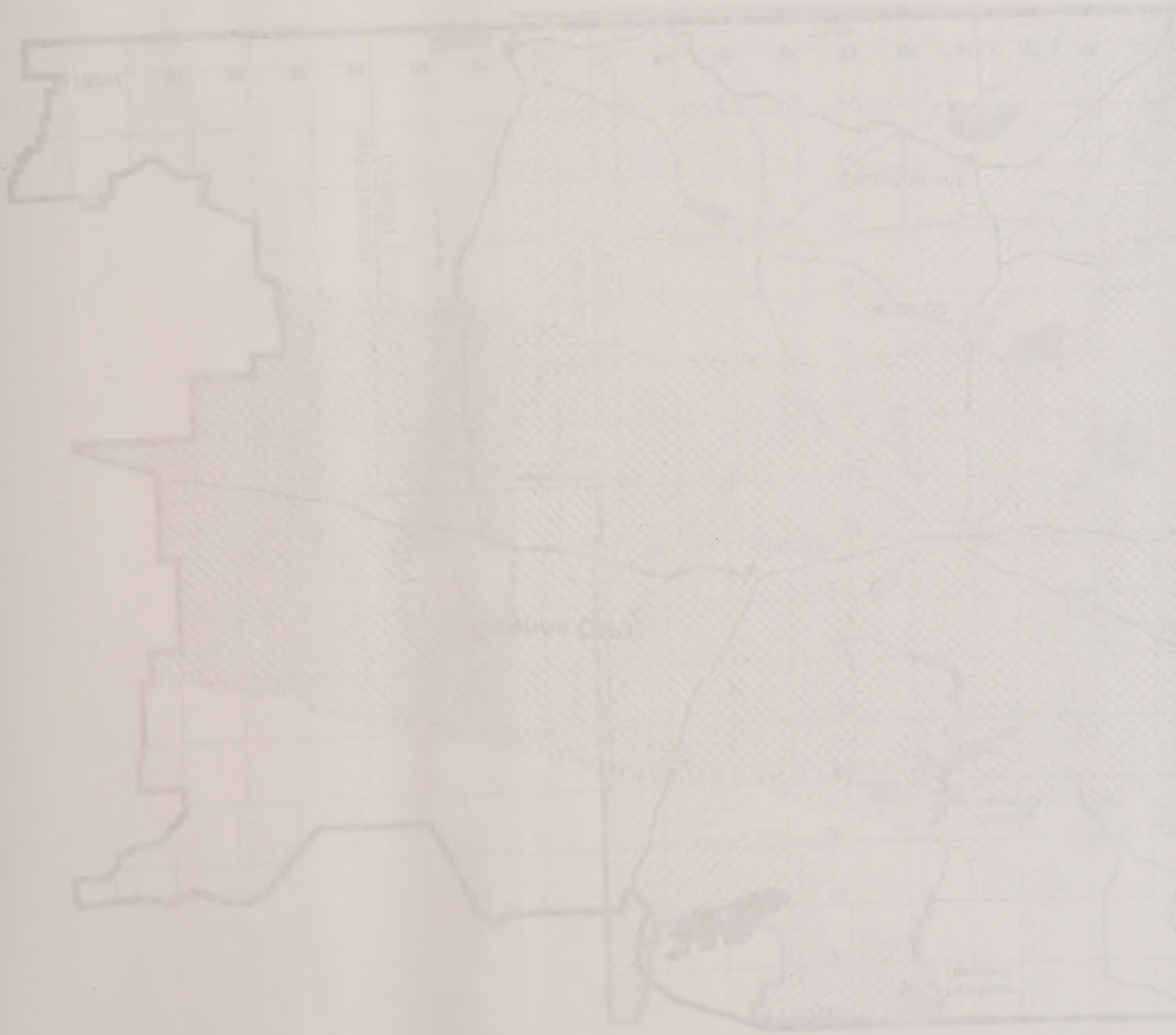
Miles

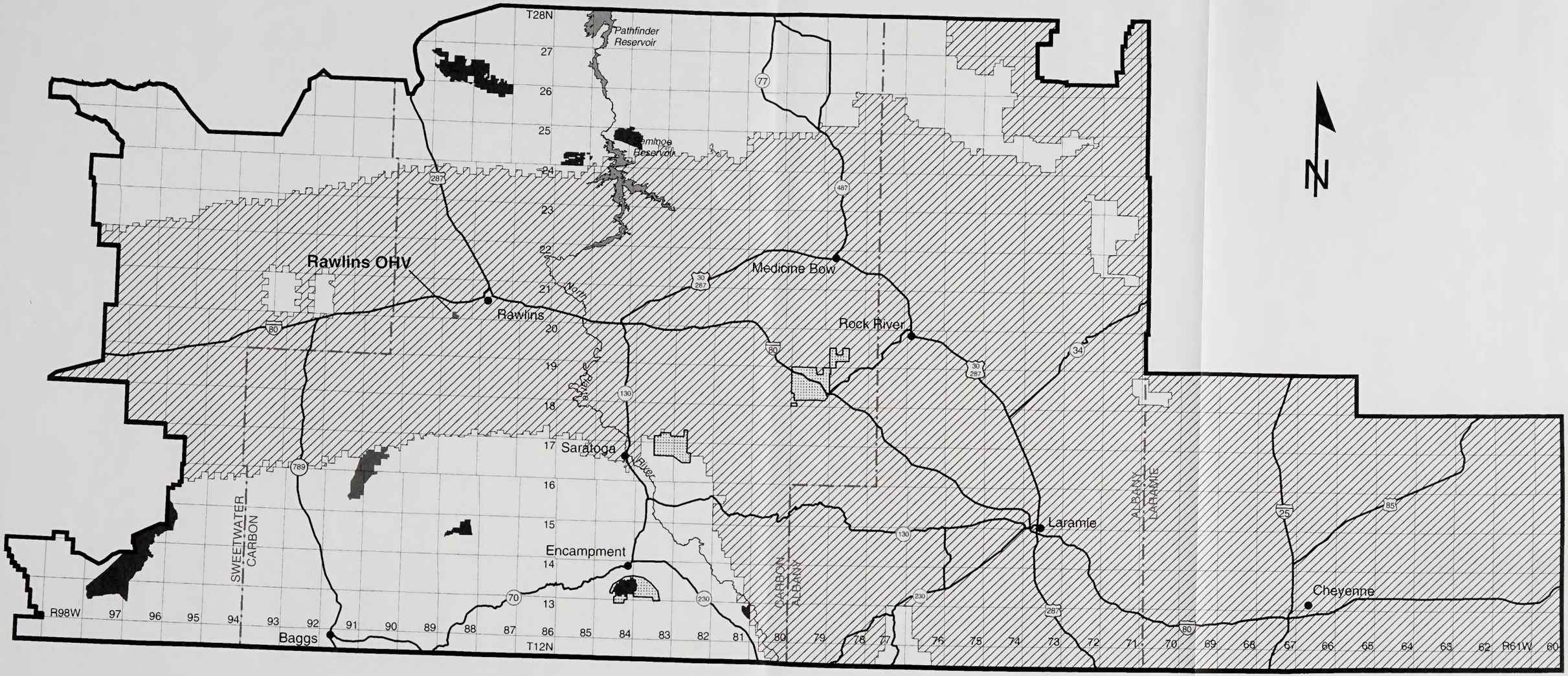
Map 2-42

OHV Designations

Alternative 2

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Closed

Closed - Over-the-Snow Vehicles; Limited - Designated Roads and Trails

Limited - Seasonal Closure

Limited - Existing Roads and Vehicle Routes

Limited - Designated Roads and Trails/Existing Roads and Vehicle Routes

0 10 20 40 60 80 100
Kilometers

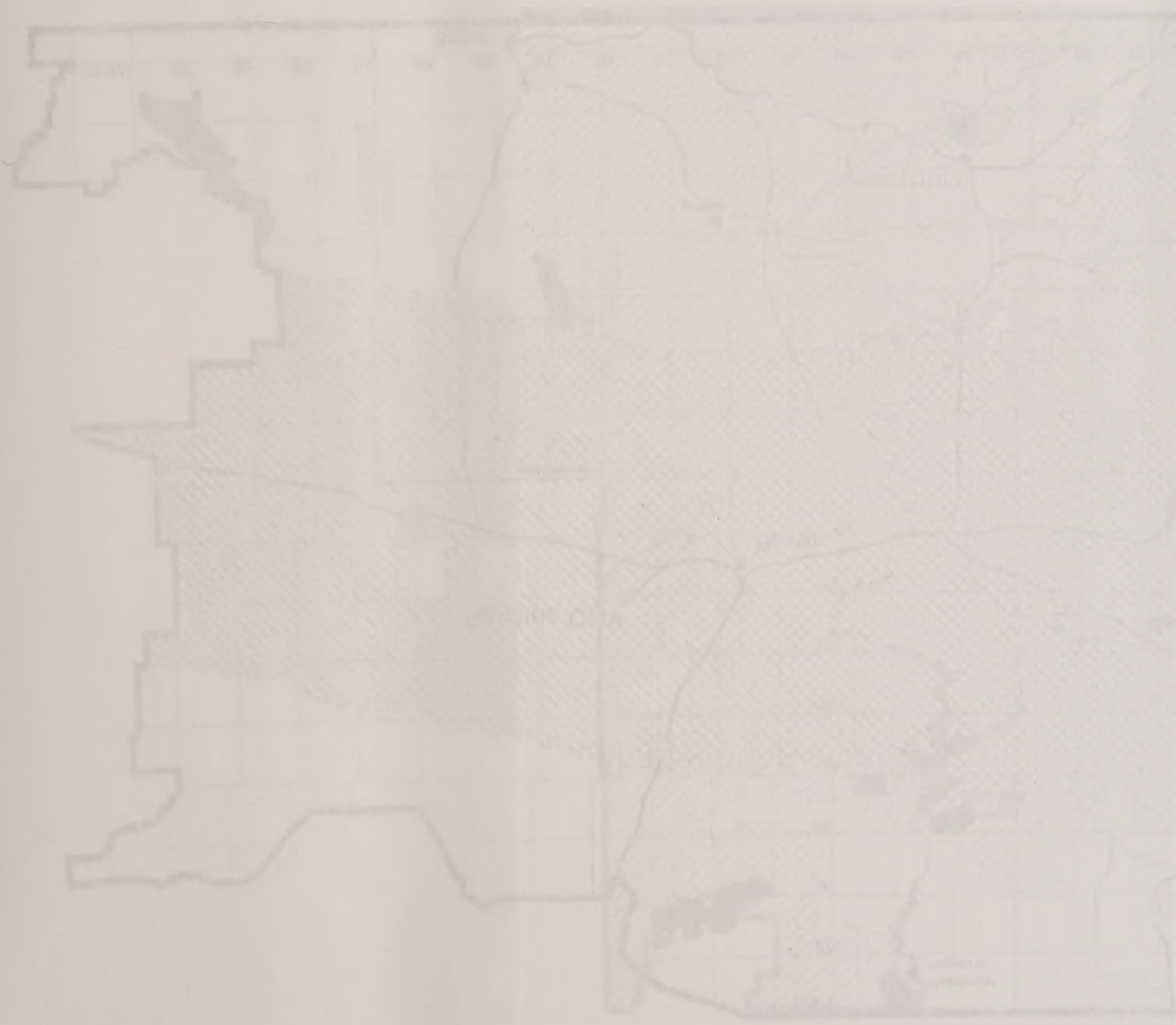
0 5 10 20 30 40 50
Miles

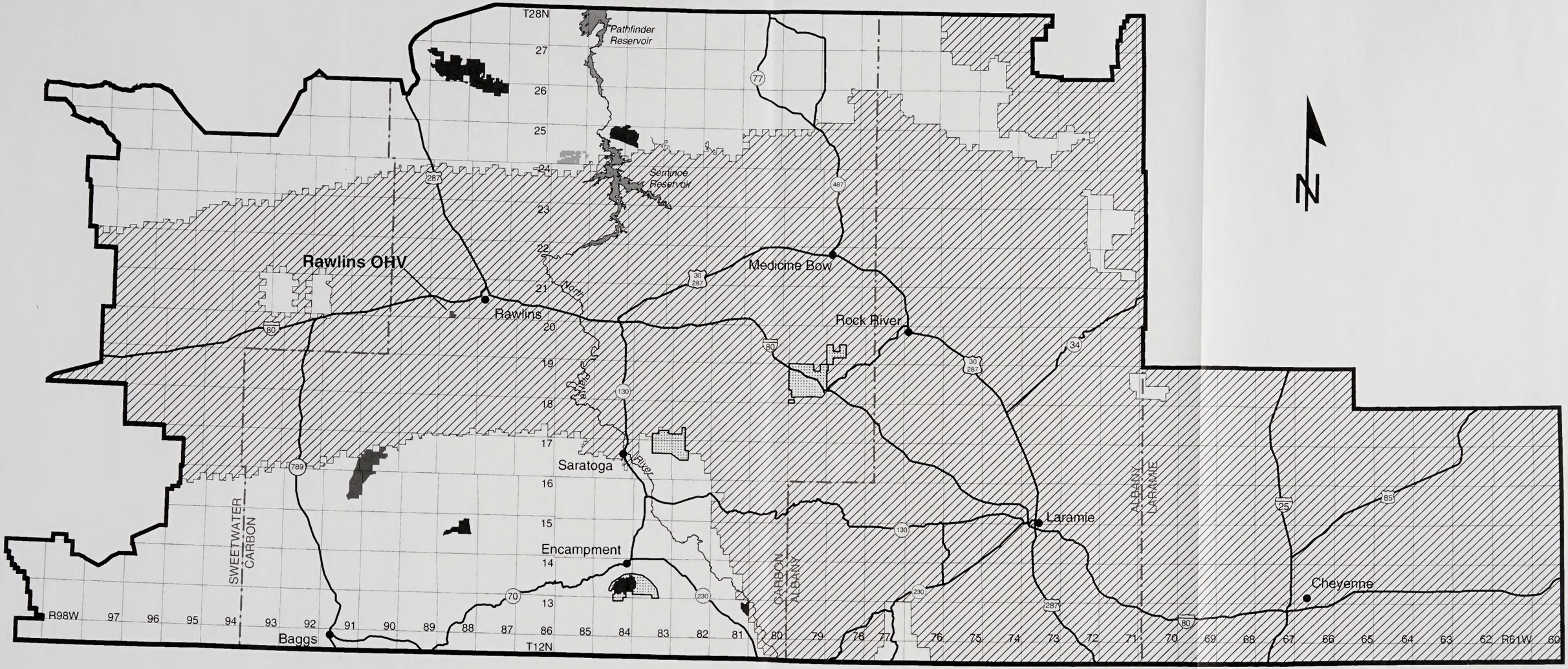
Map 2-43

OHV Designations

Alternative 3

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Open

Closed

Closed - Over-the-Snow Vehicles; Limited - Designated Roads and Trails

Limited - Seasonal Closure

Limited - Existing Roads and Vehicle Routes

Limited - Designated Roads and Trails/Existing Roads and Vehicle Routes

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

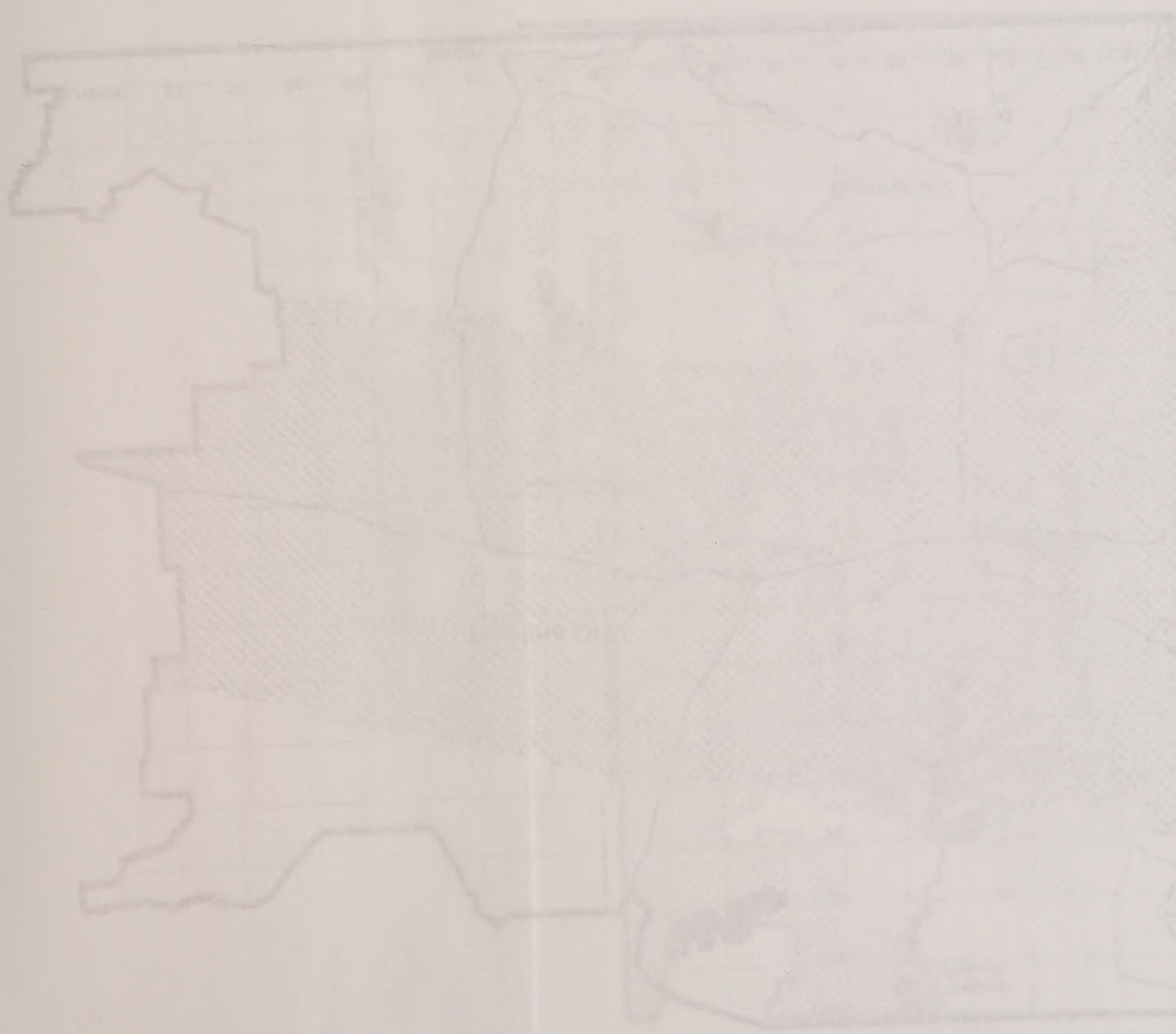
Miles

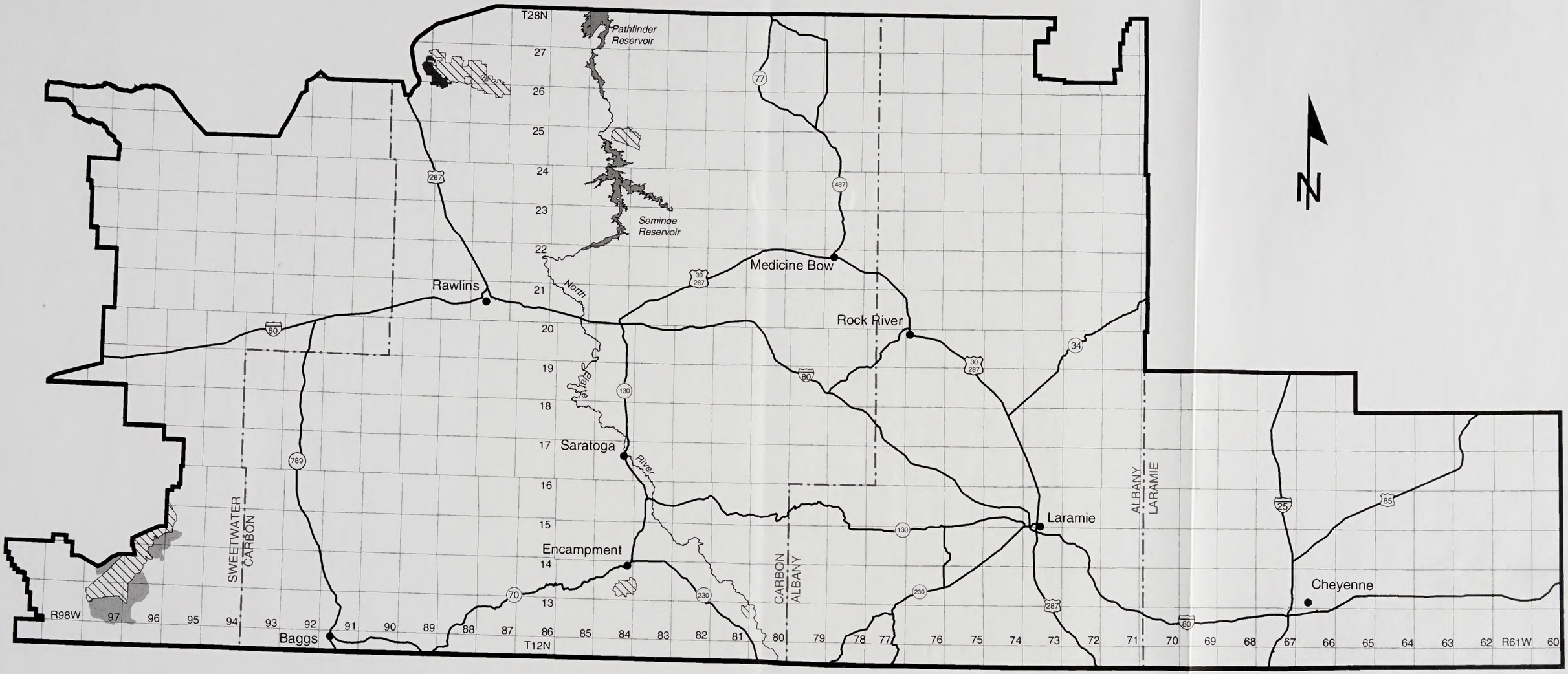
Map 2-44

OHV Designations

Alternative 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





West Ferris Mountains

Adobe Town Fringe

Wilderness Study Areas

0 10 20 40 60 80 100

Kilometers

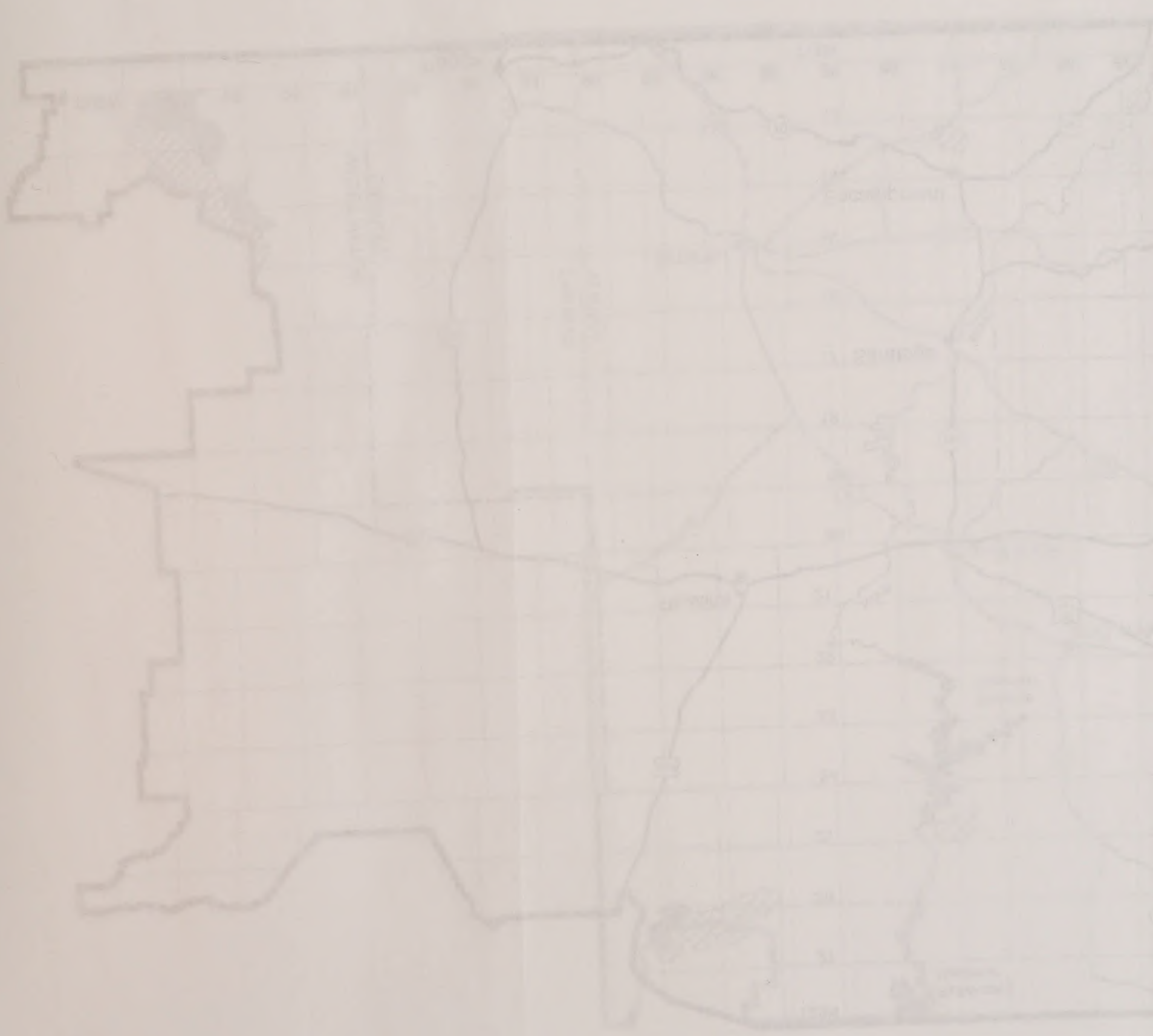
0 5 10 20 30 40 50

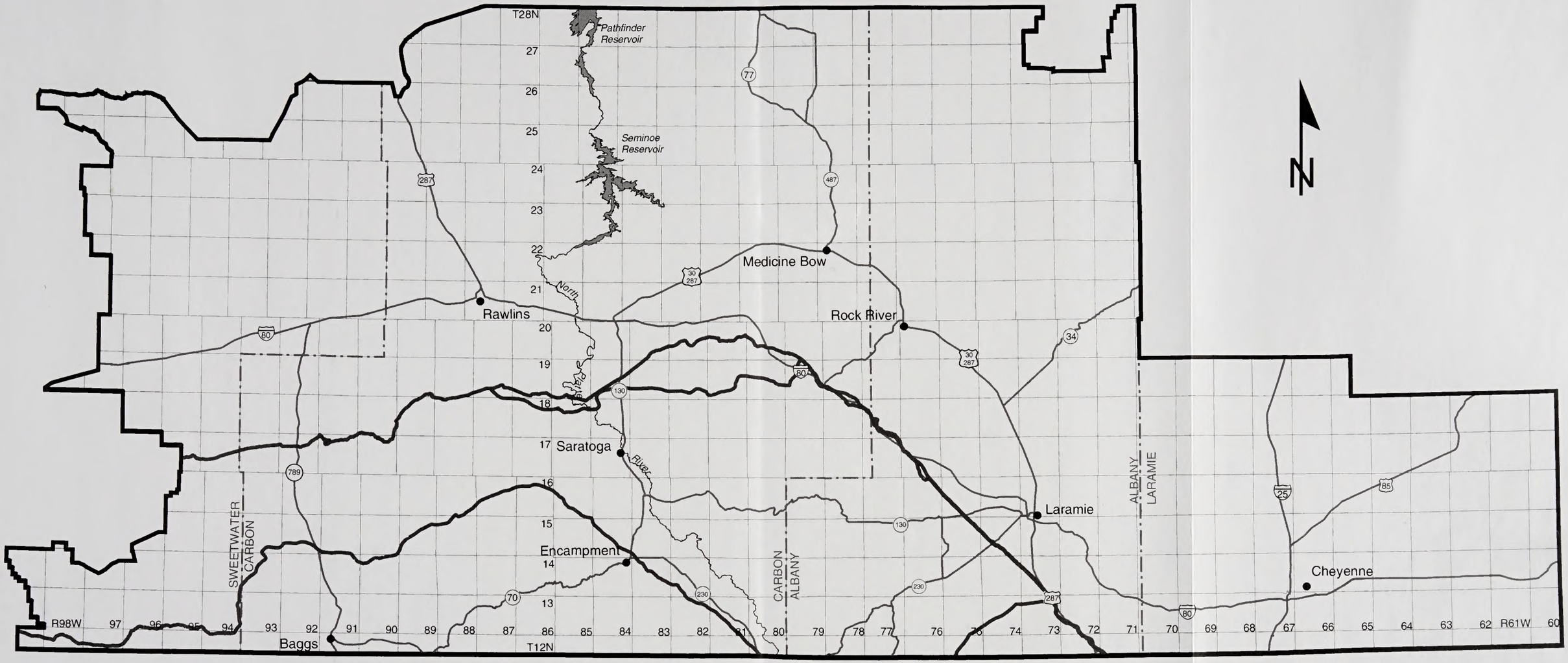
Miles

Map 2-45

Areas with Wilderness Characteristics

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





1/4 Mile Avoidance Area

0 10 20 40 60 80 100
Kilometers

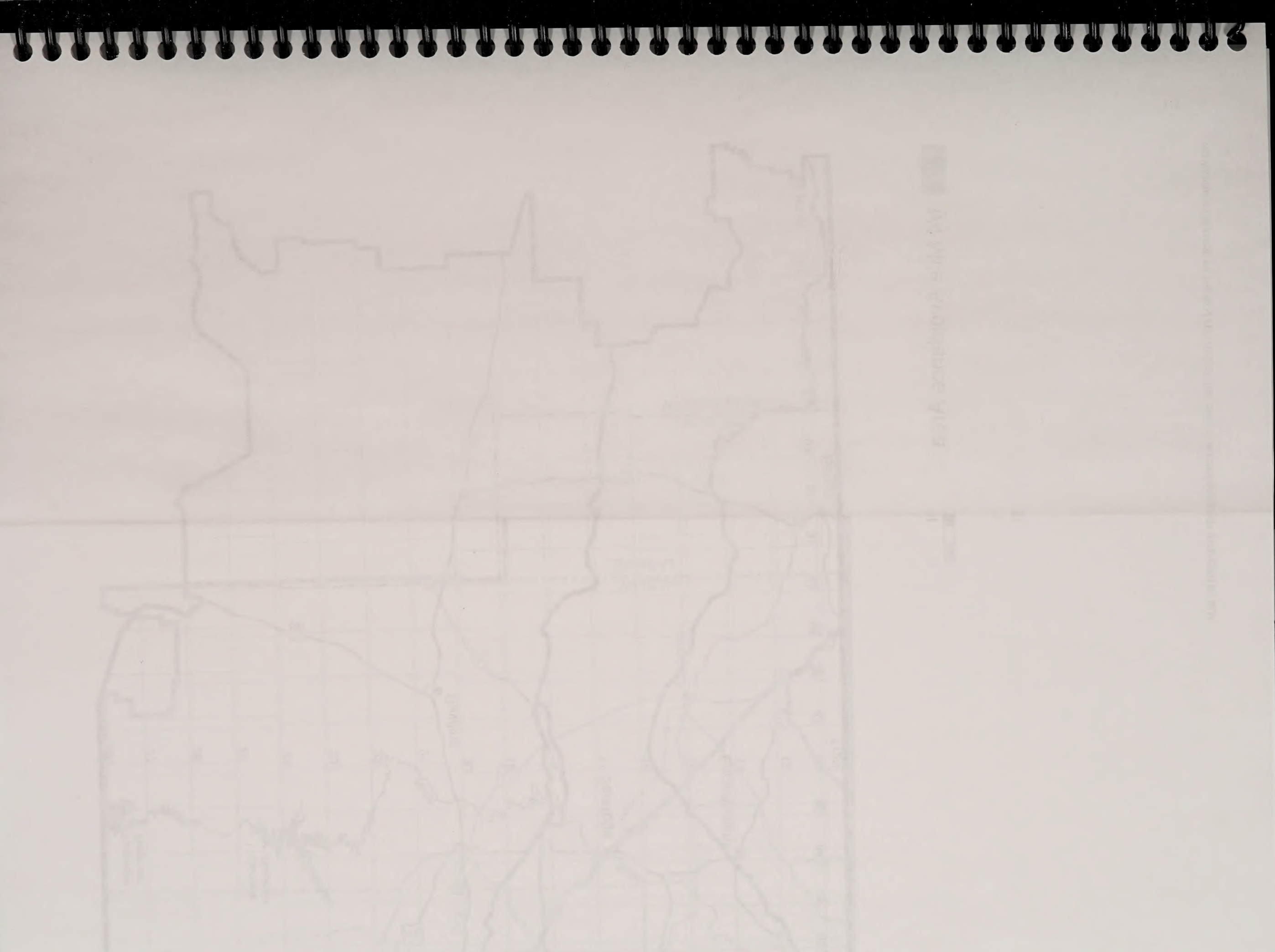
0 5 10 20 30 40 50
Miles

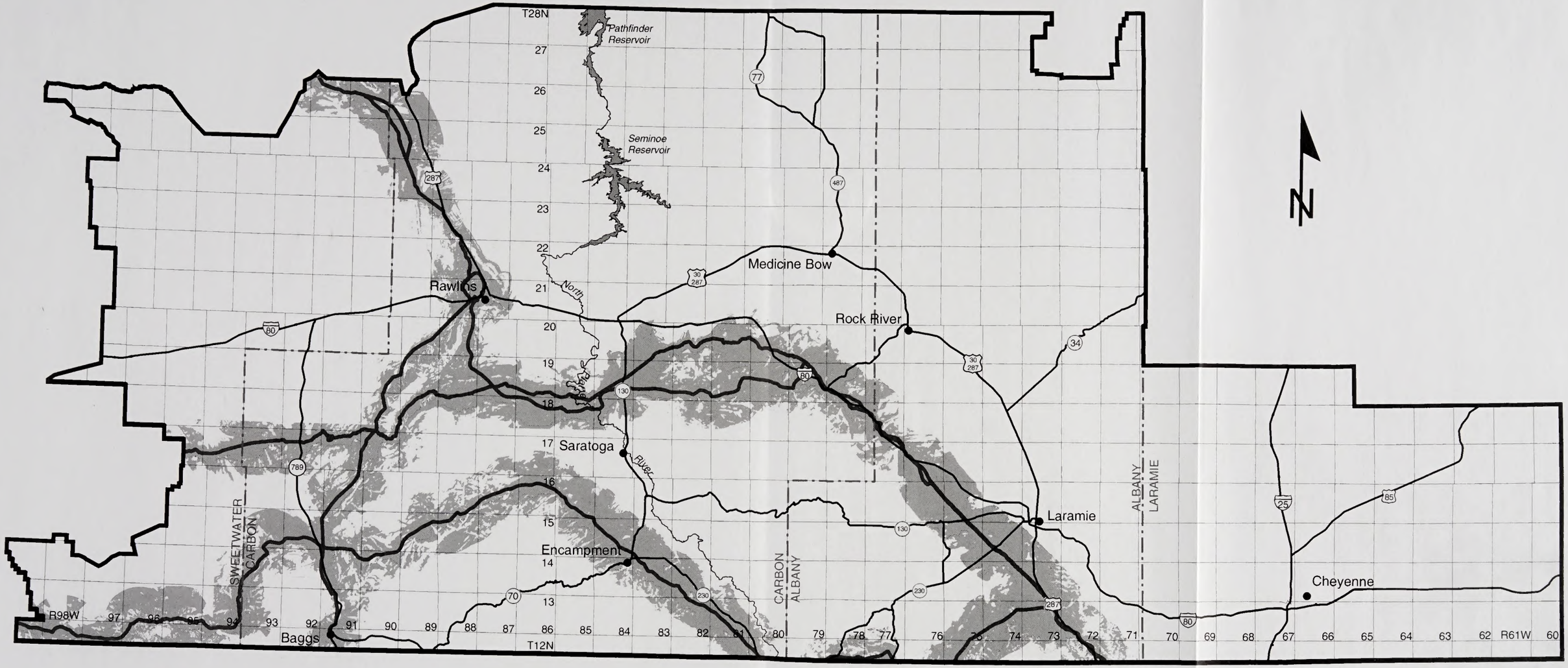
Map 2-46

Historic Trails

Alternatives 1 & 2

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





1/4 Mile No Surface Occupancy

5 Mile Viewshed

0 10 20 40 60 80 100
Kilometers

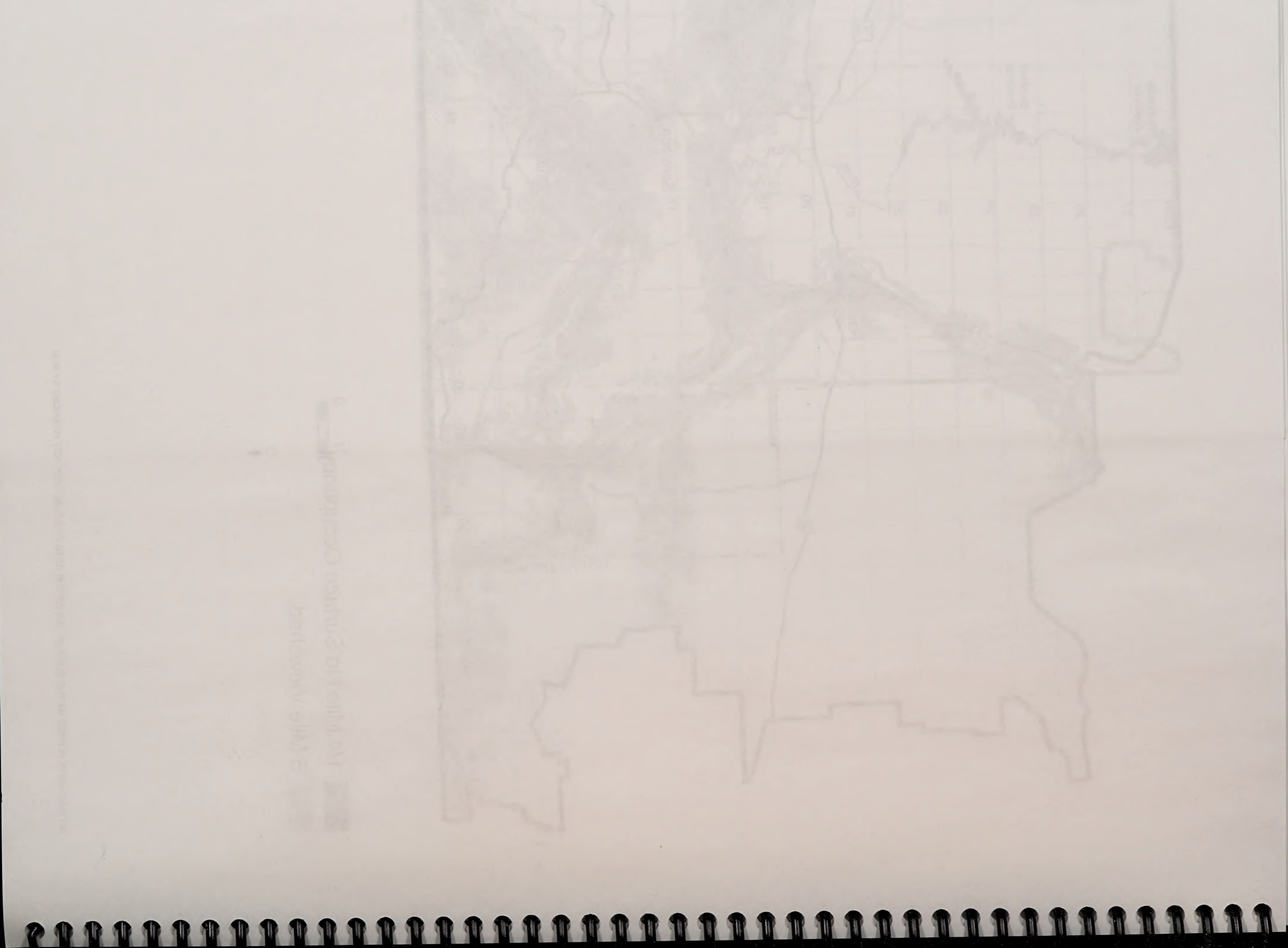
0 5 10 20 30 40 50
Miles

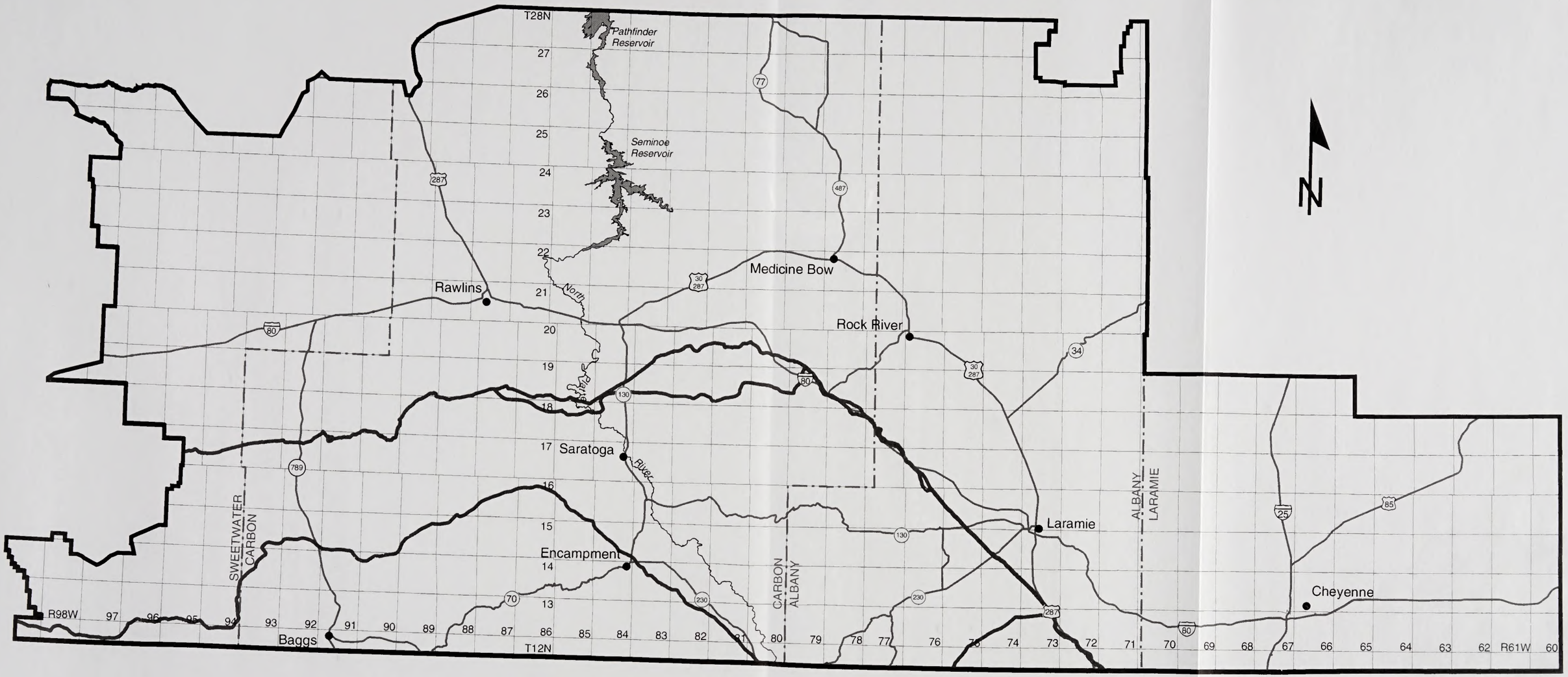
Map 2-47

Historic Trails

Alternative 3

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





1/4 Mile No Surface Occupancy

0 10 20 40 60 80 100
Kilometers

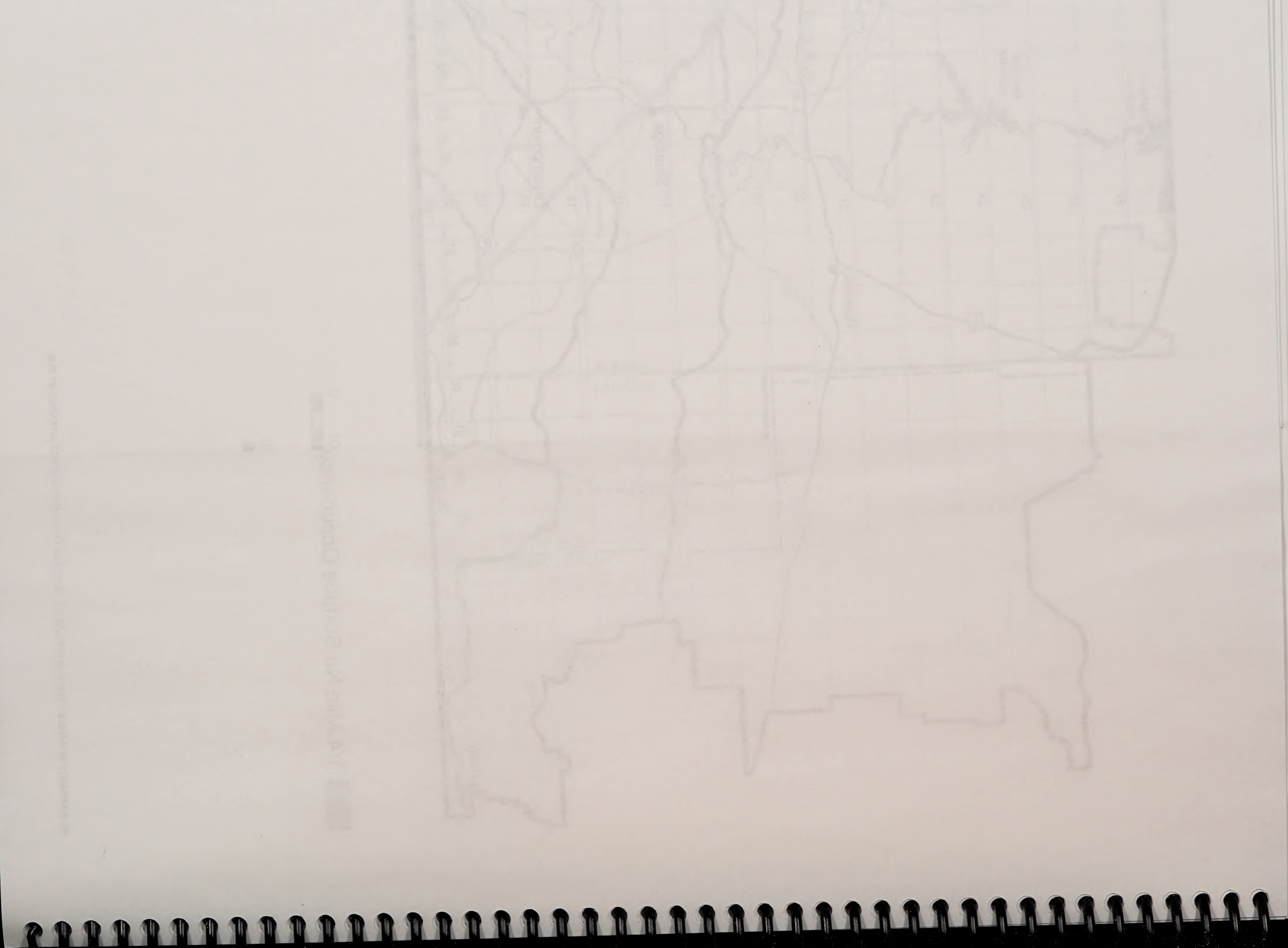
0 5 10 20 30 40 50
Miles

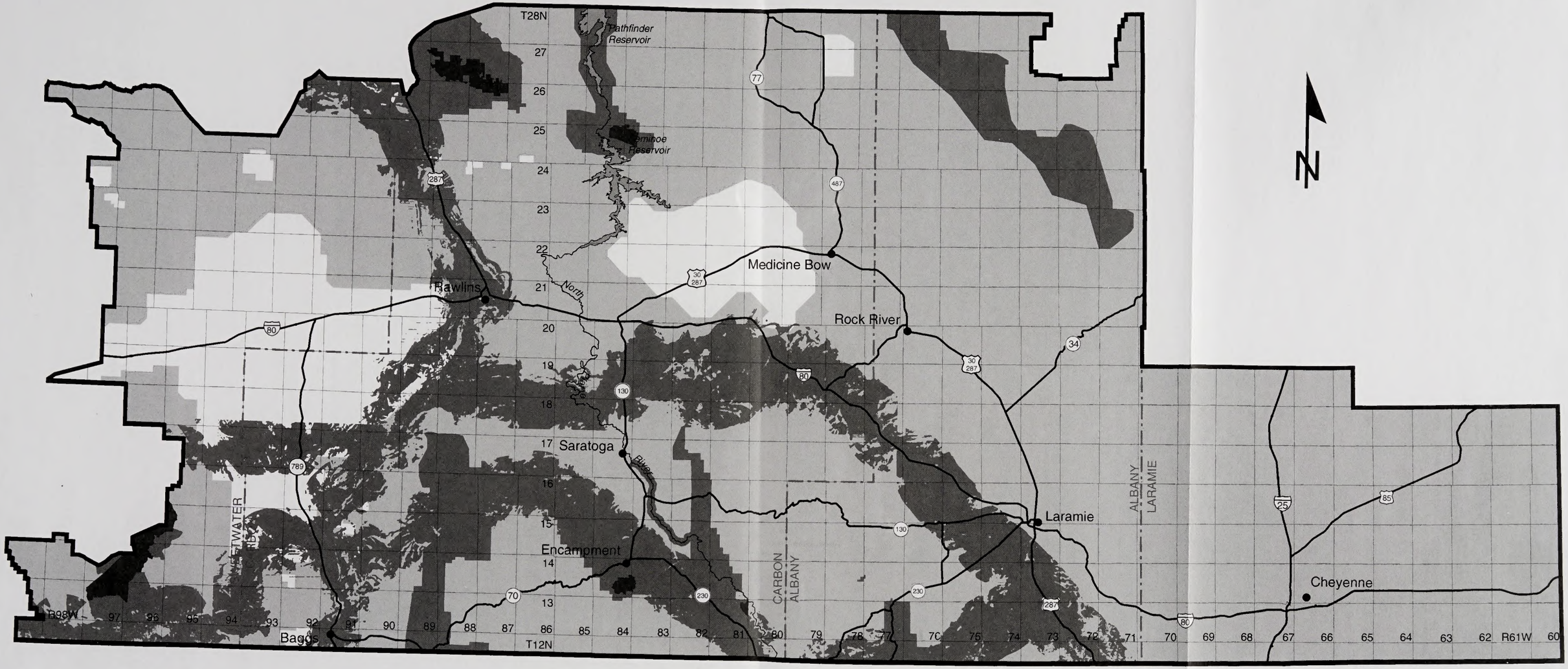
Map 2-48

Historic Trails

Alternative 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Class I - Preserve the existing character of the landscape

Class II - Retain the existing character of the landscape

Class III - Partially retain the existing character of the landscape

Class IV - Management activities may dominate the landscape

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

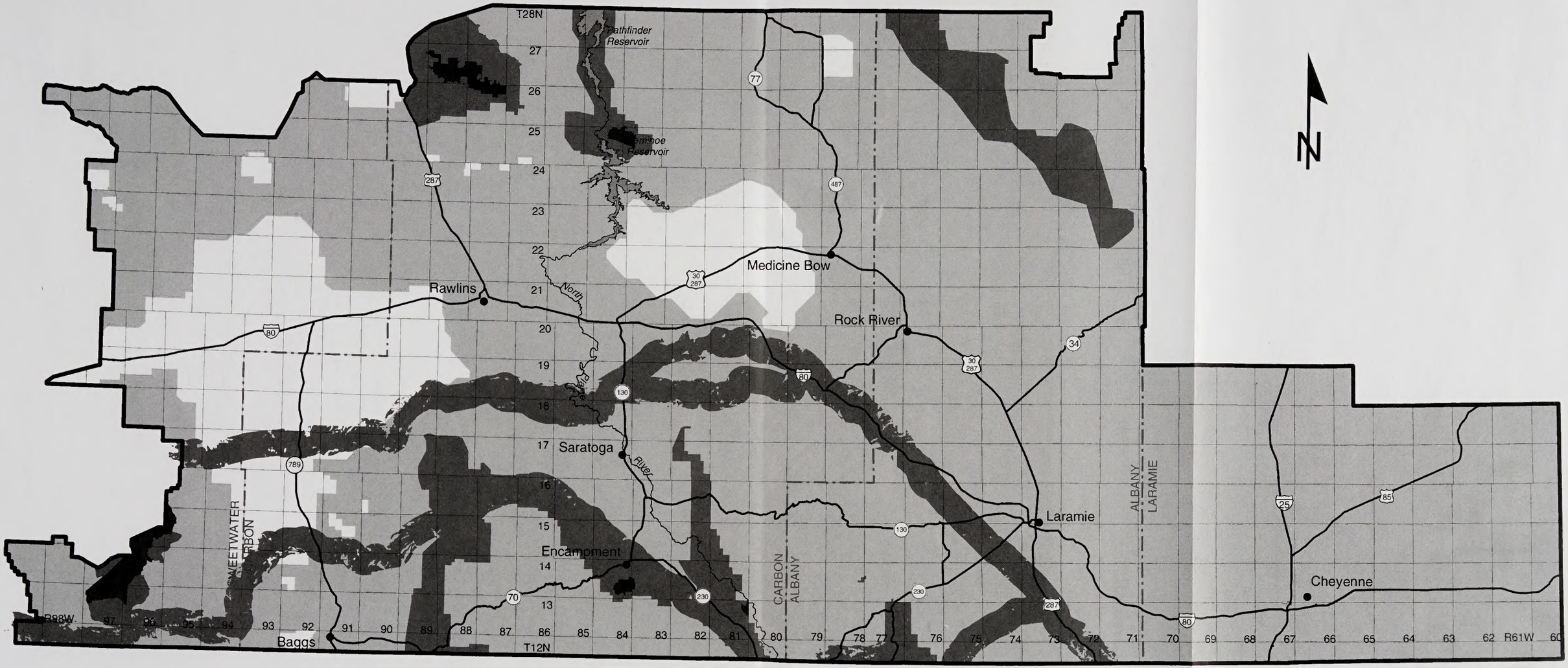
Miles

Map 2-49

Visual Resource Management

Alternative 3

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM



- Class I - Preserve the existing character of the landscape
- Class II - Retain the existing character of the landscape
- Class III - Partially retain the existing character of the landscape
- Class IV - Management activities may dominate the landscape

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 2-50

Visual Resource Management

Alternative 4

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM



Class I - Preserve the existing character of the landscape

Class II - Retain the existing character of the landscape

Class III - Partially retain the existing character of the landscape

Class IV - Management activities may dominate the landscape

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

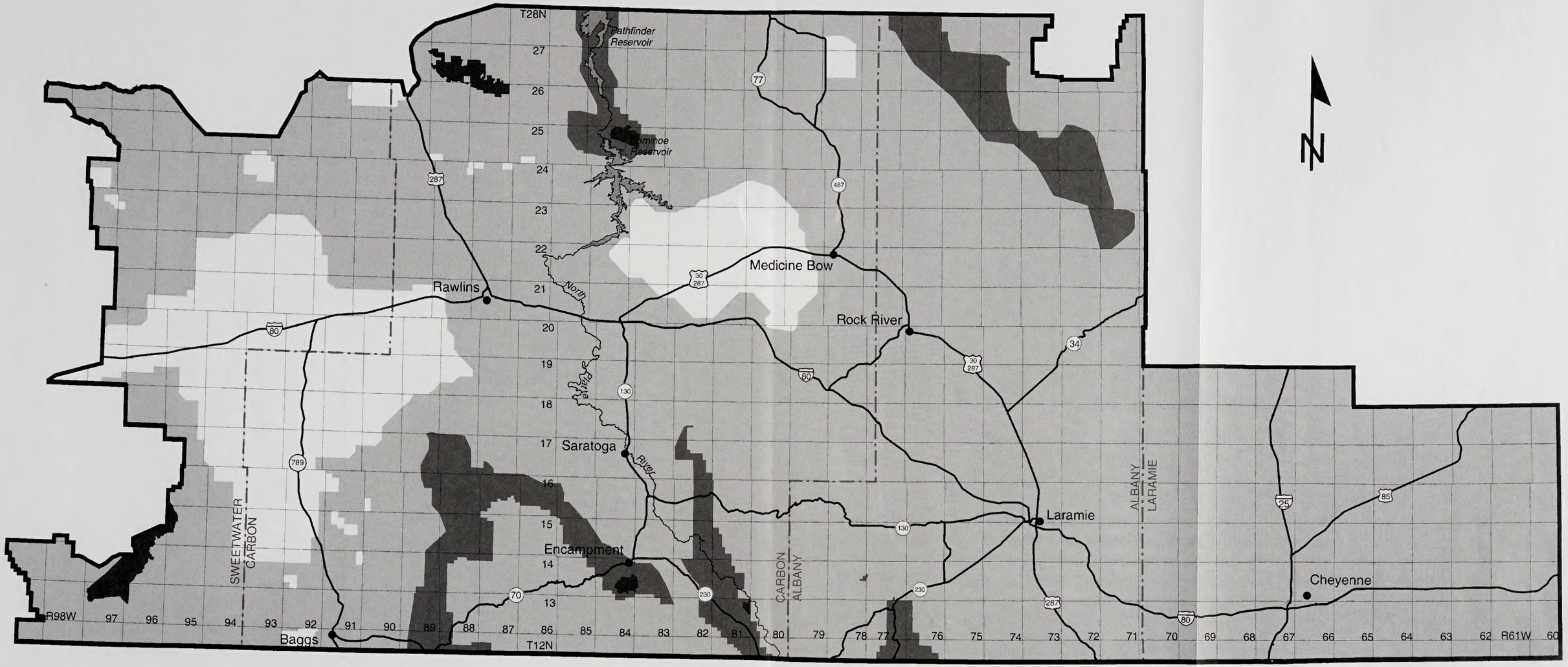
Miles

Map 2-51

Visual Resource Management

Alternative 1

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM



Class I - Preserve the existing character of the landscape

Class II - Retain the existing character of the landscape

Class III - Partially retain the existing character of the landscape

Class IV - Management activities may dominate the landscape

0 10 20 40 60 80 100

Kilometers

0 5 10 20 30 40 50

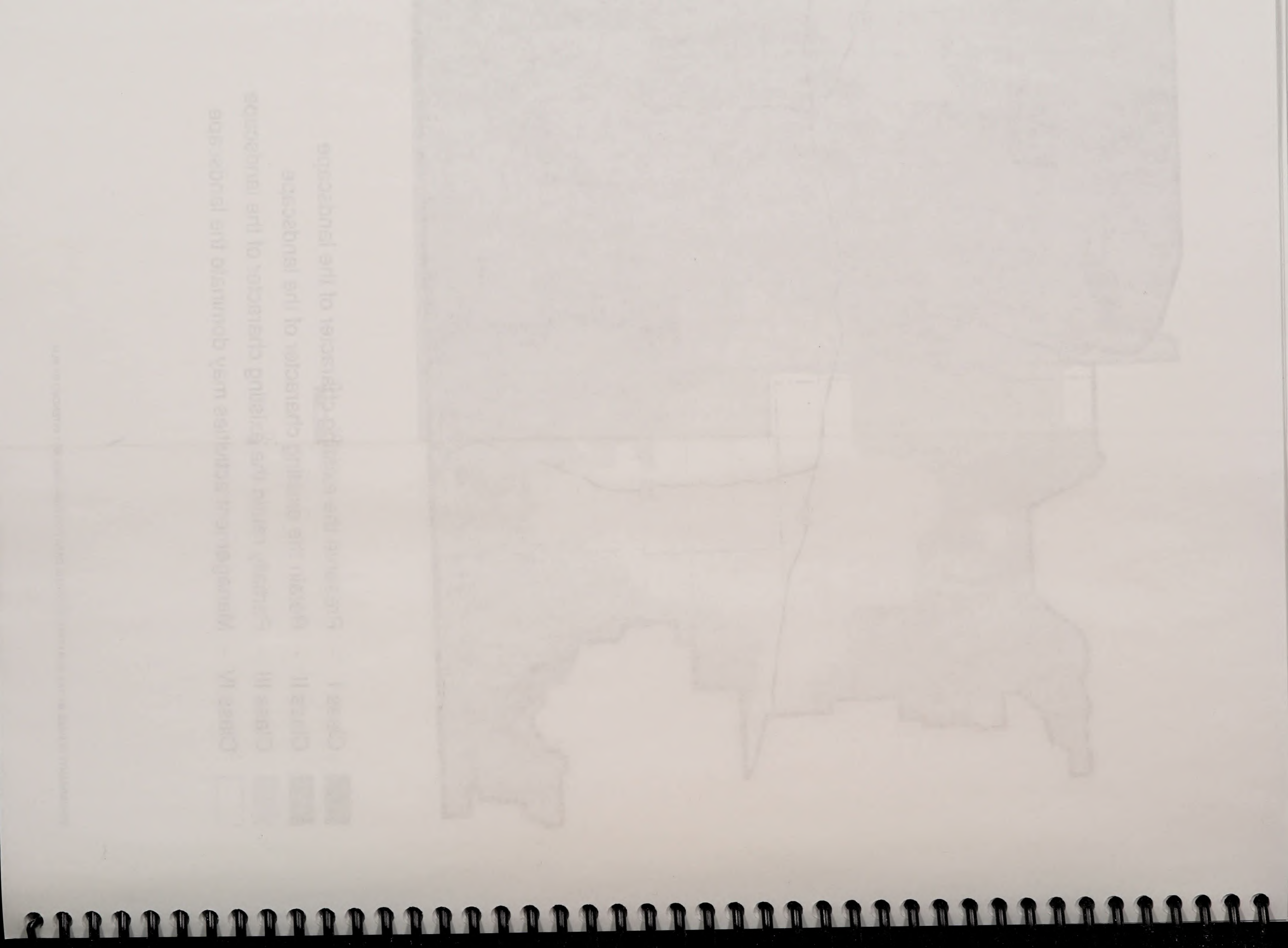
Miles

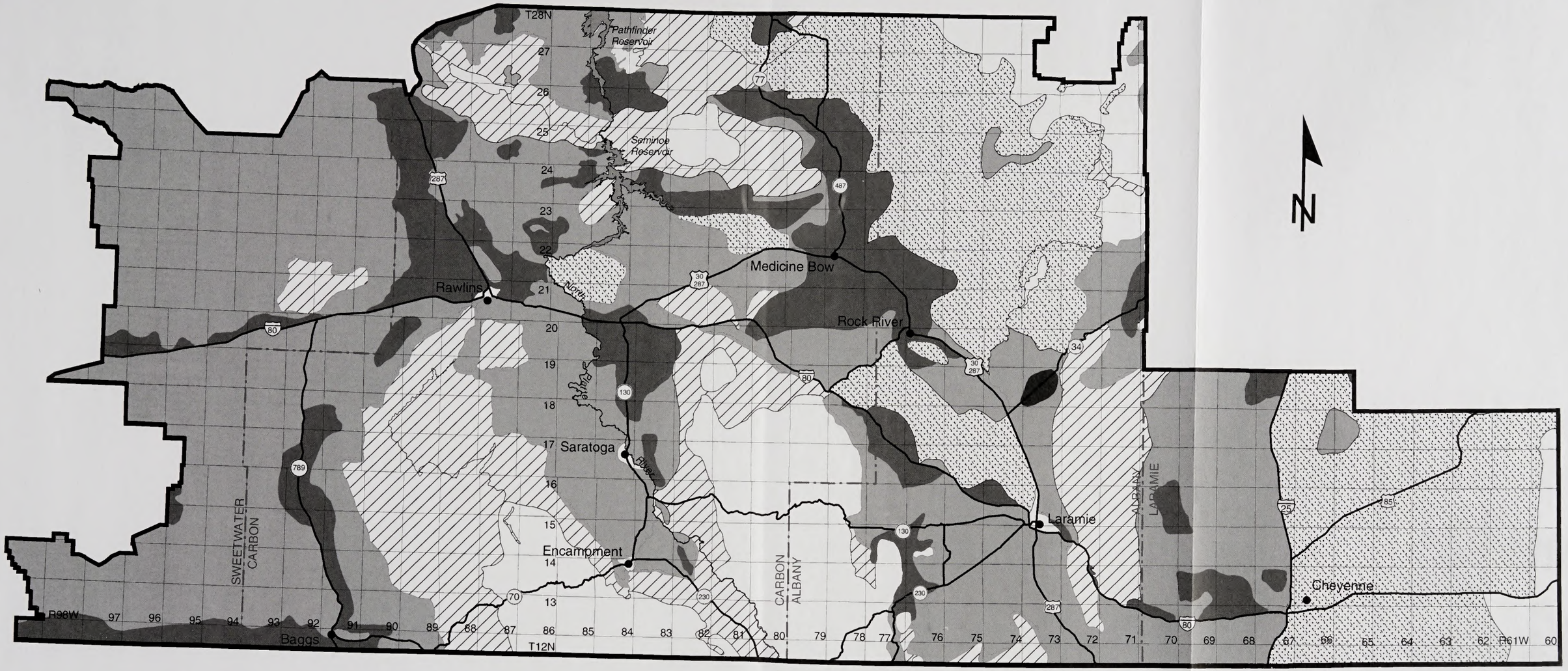
Map 2-52

Visual Resource Management

Alternative 2

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





- Crucial Winter
- Crucial Year-Long
- Winter/Yearlong
- Spring/Summer/Fall
- Yearlong

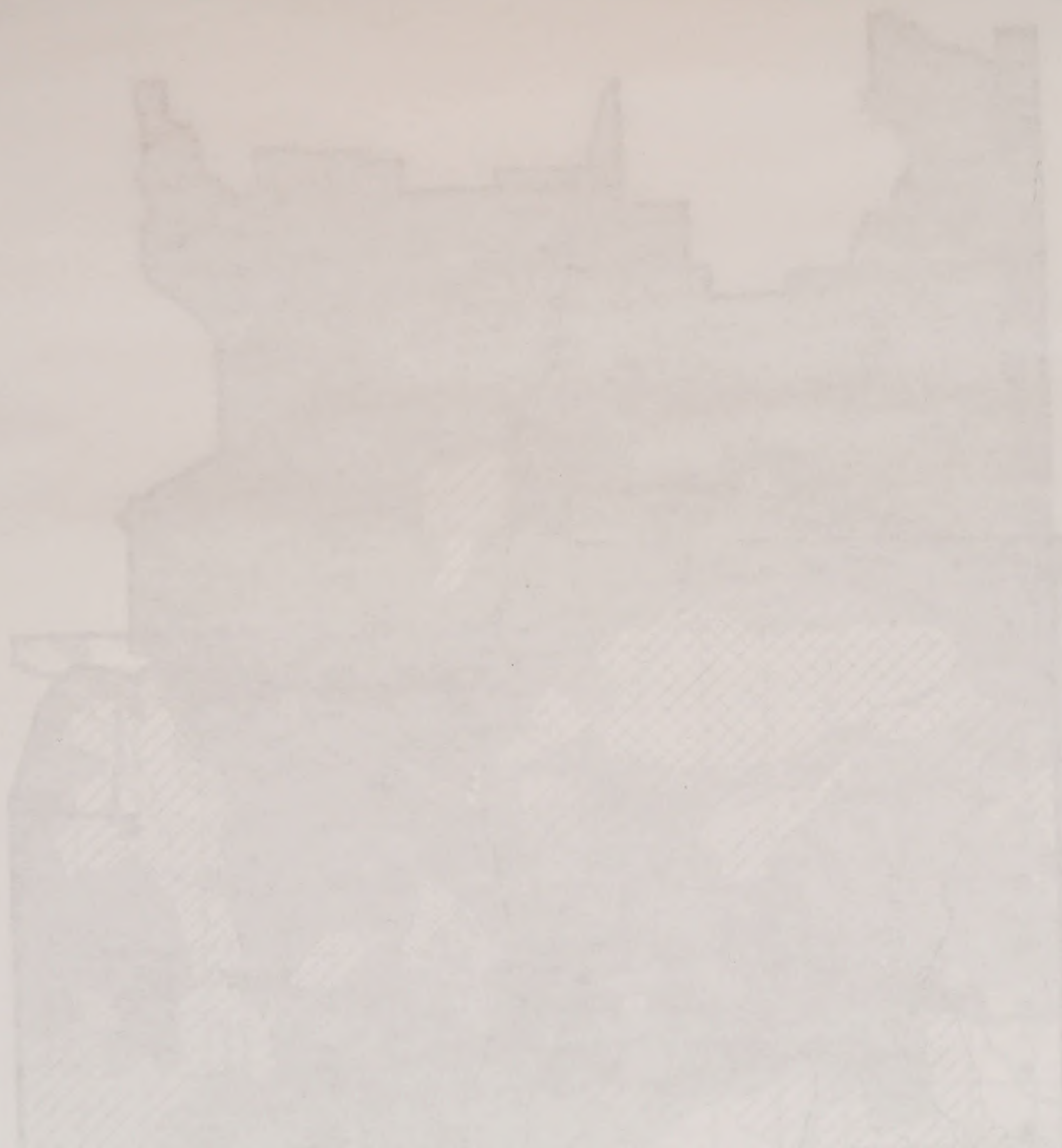
0 10 20 40 60 80 100
Kilometers

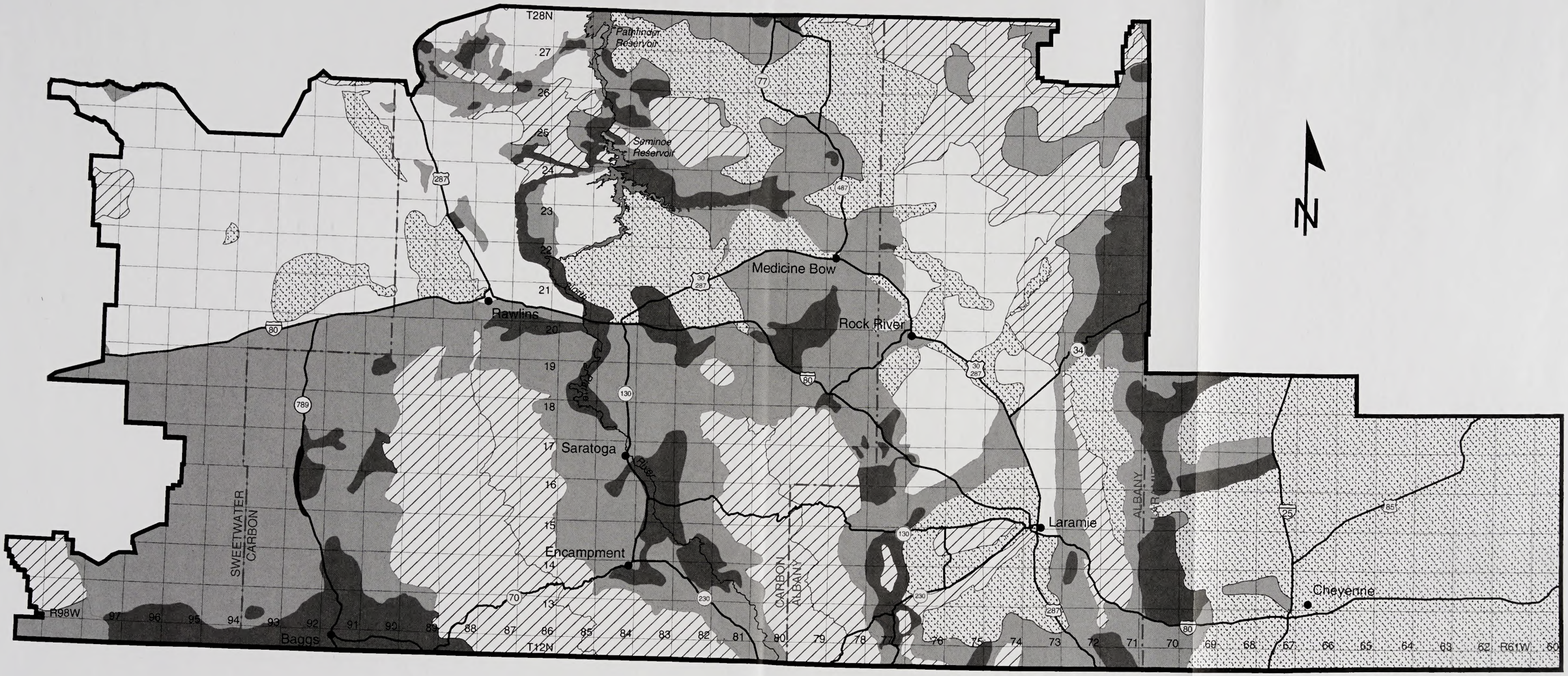
0 5 10 20 30 40 50
Miles

Map 2-53

Pronghorn Habitat

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Crucial Winter
Crucial Year-Long
Winter/Yearlong
Spring/Summer/Fall
Yearlong

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 2-54

Mule Deer Habitat

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Crucial Year-Long
Winter/Yearlong
Spring/Summer/Fall
Yearlong
Lambing Areas

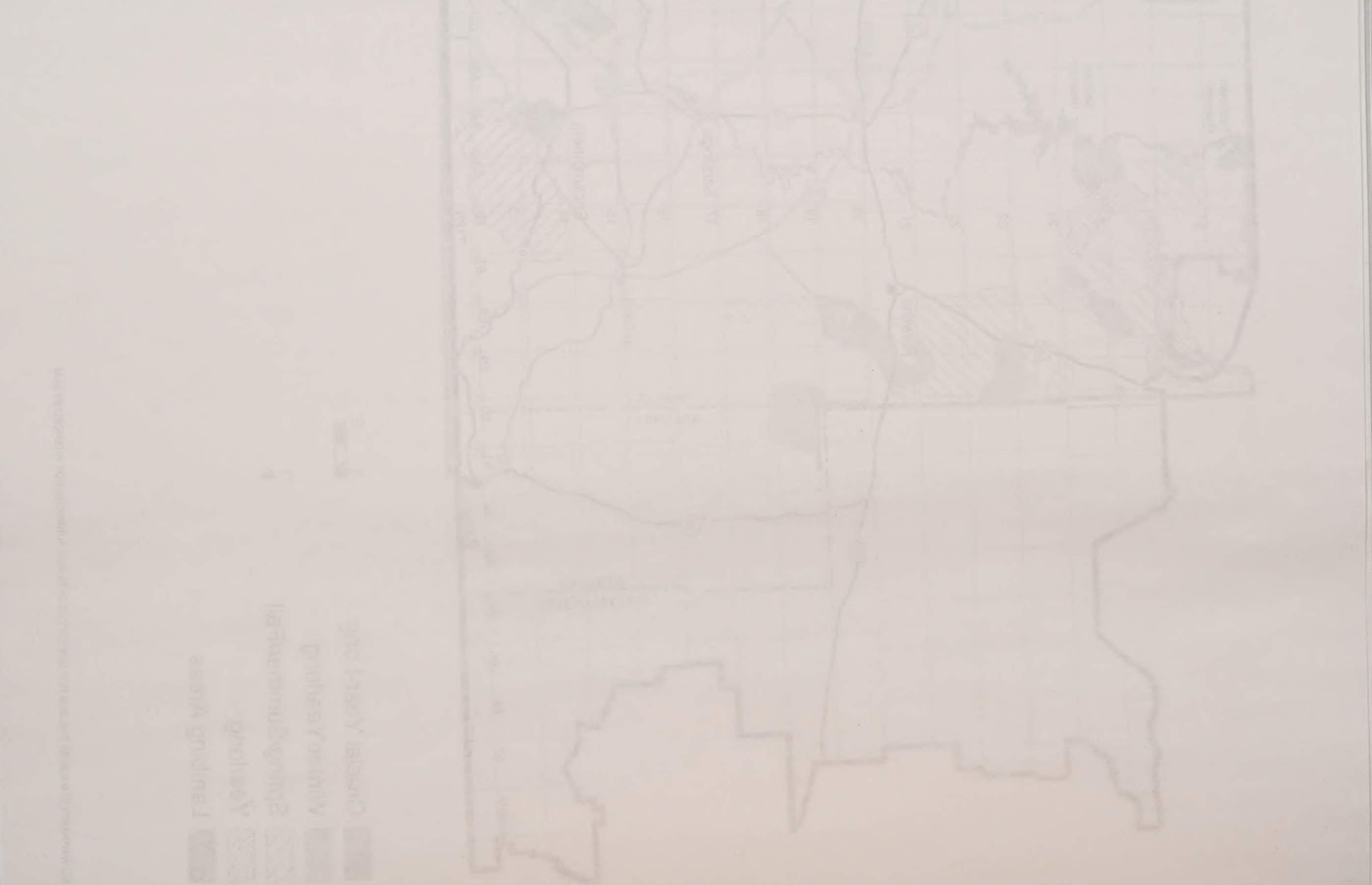
0 10 20 40 60 80 100
Kilometers

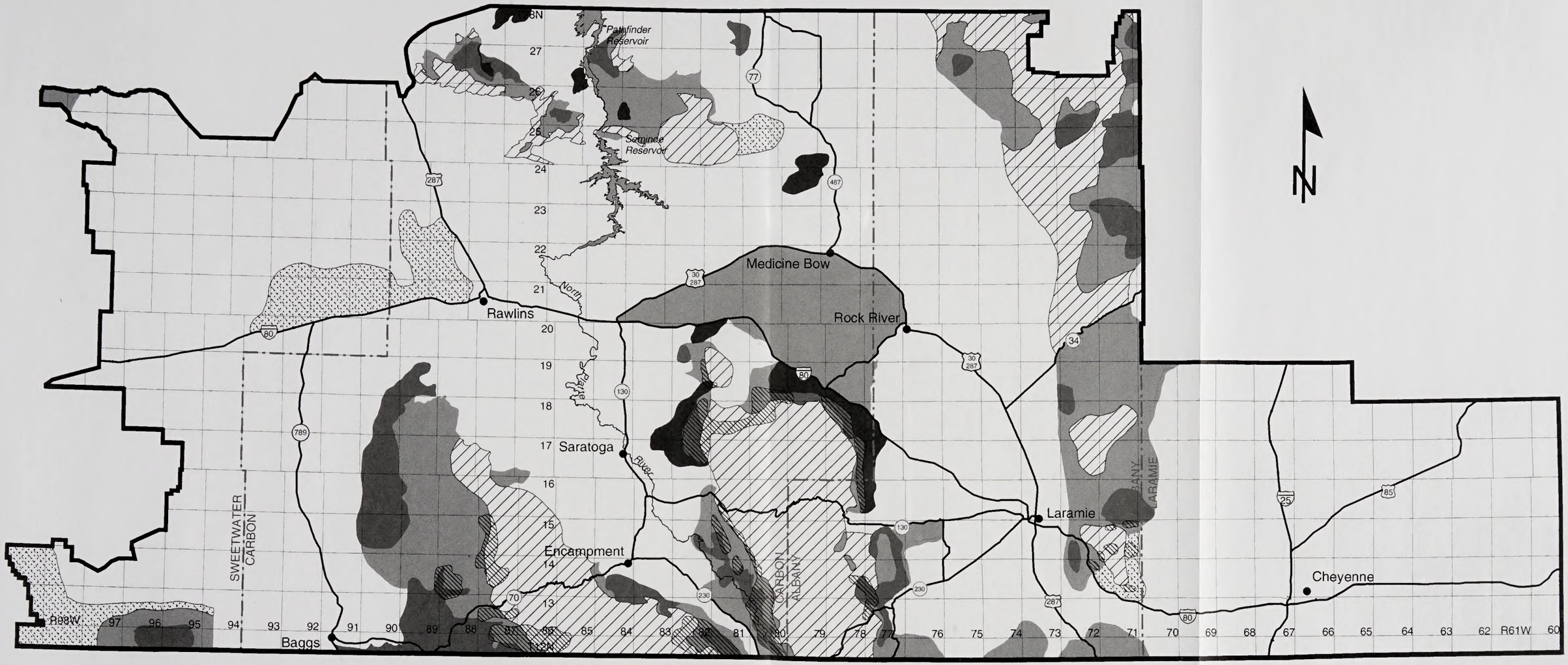
0 5 10 20 30 40 50
Miles

Map 2-55

Bighorn Sheep Habitat and Lambing Areas

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





- Crucial Winter
- Crucial Year-Long
- Winter/Yearlong
- Spring/Summer/Fall
- Yearlong
- Parturition Areas

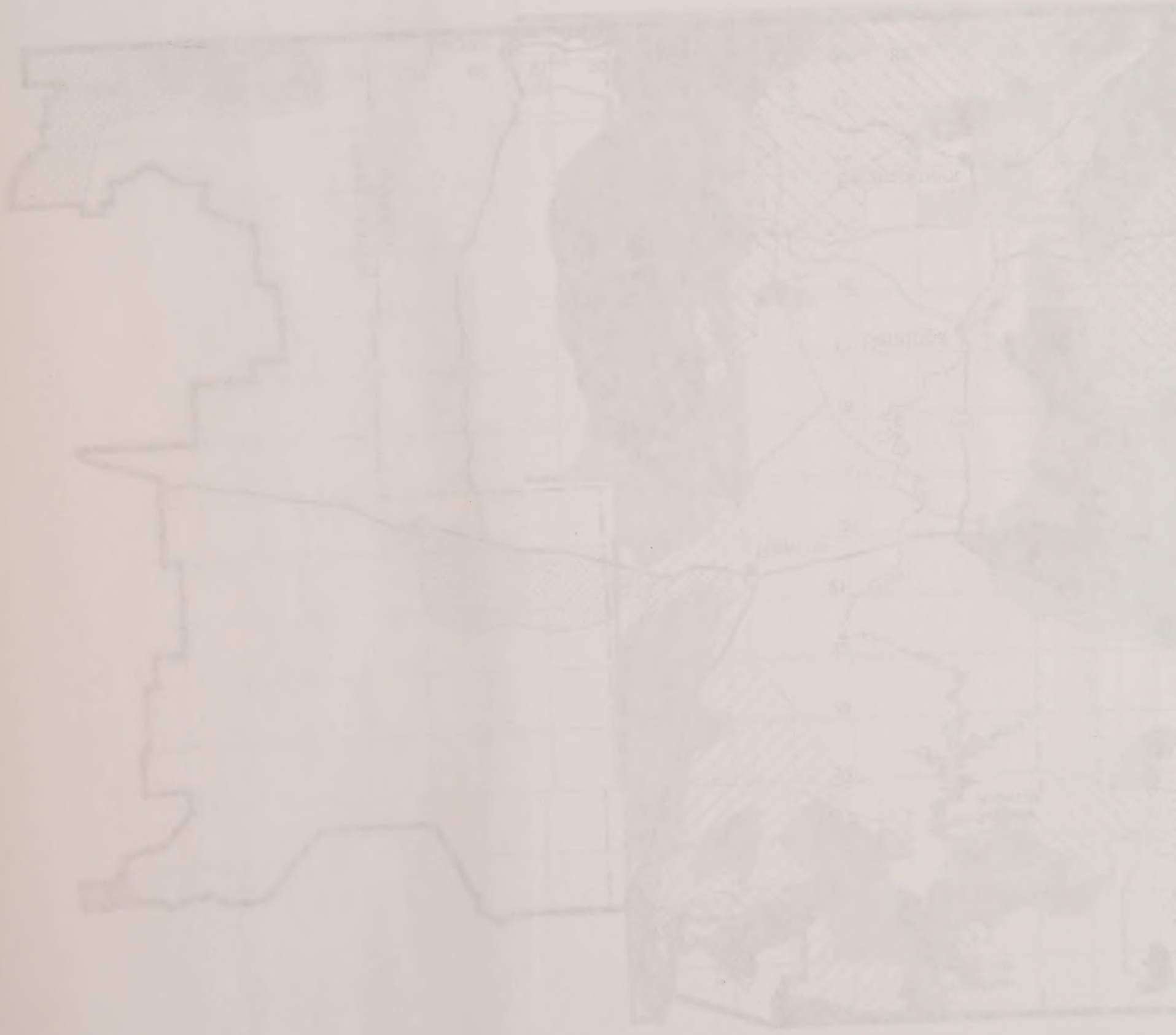
0 10 20 40 60 80 100
Kilometers

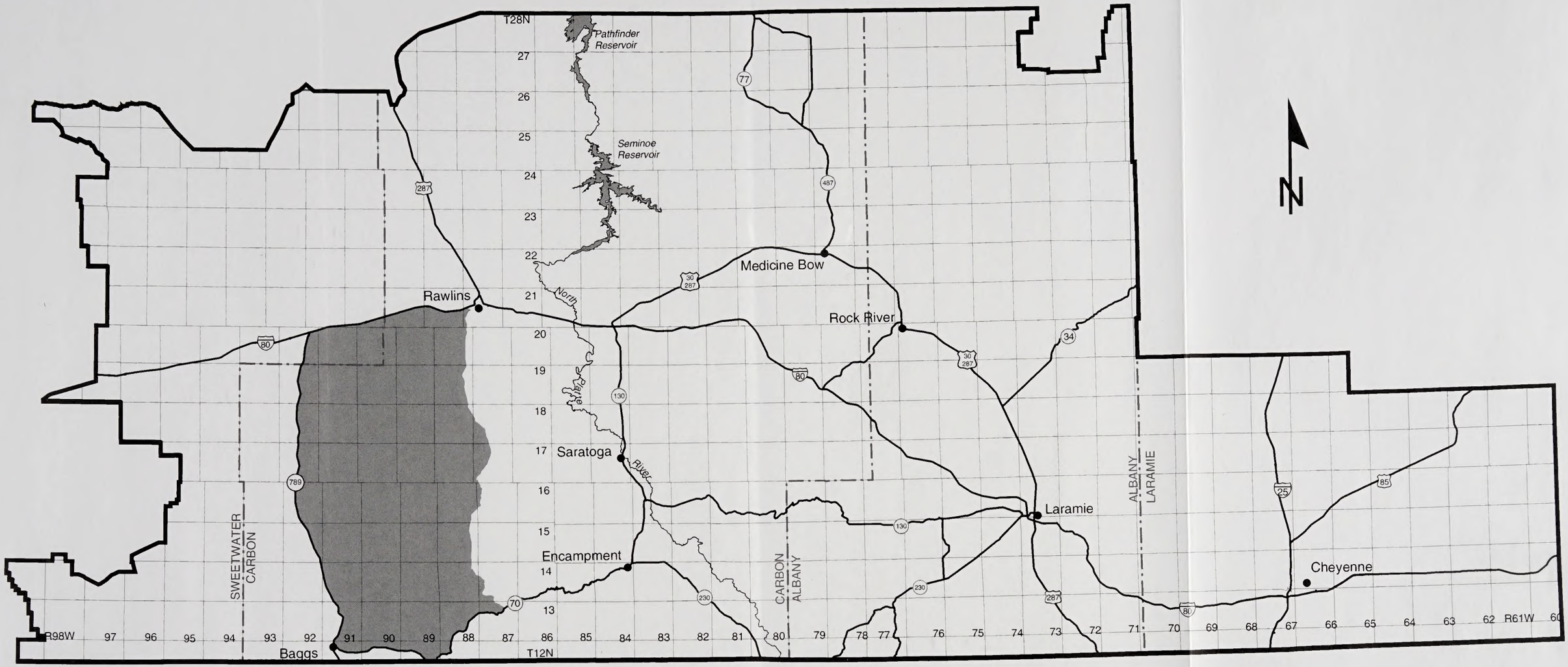
0 5 10 20 30 40 50
Miles

Map 2-56

Elk Habitat and Parturition Areas

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Area where surface disturbing activities would be subject to increased restrictions in Alternative 3.

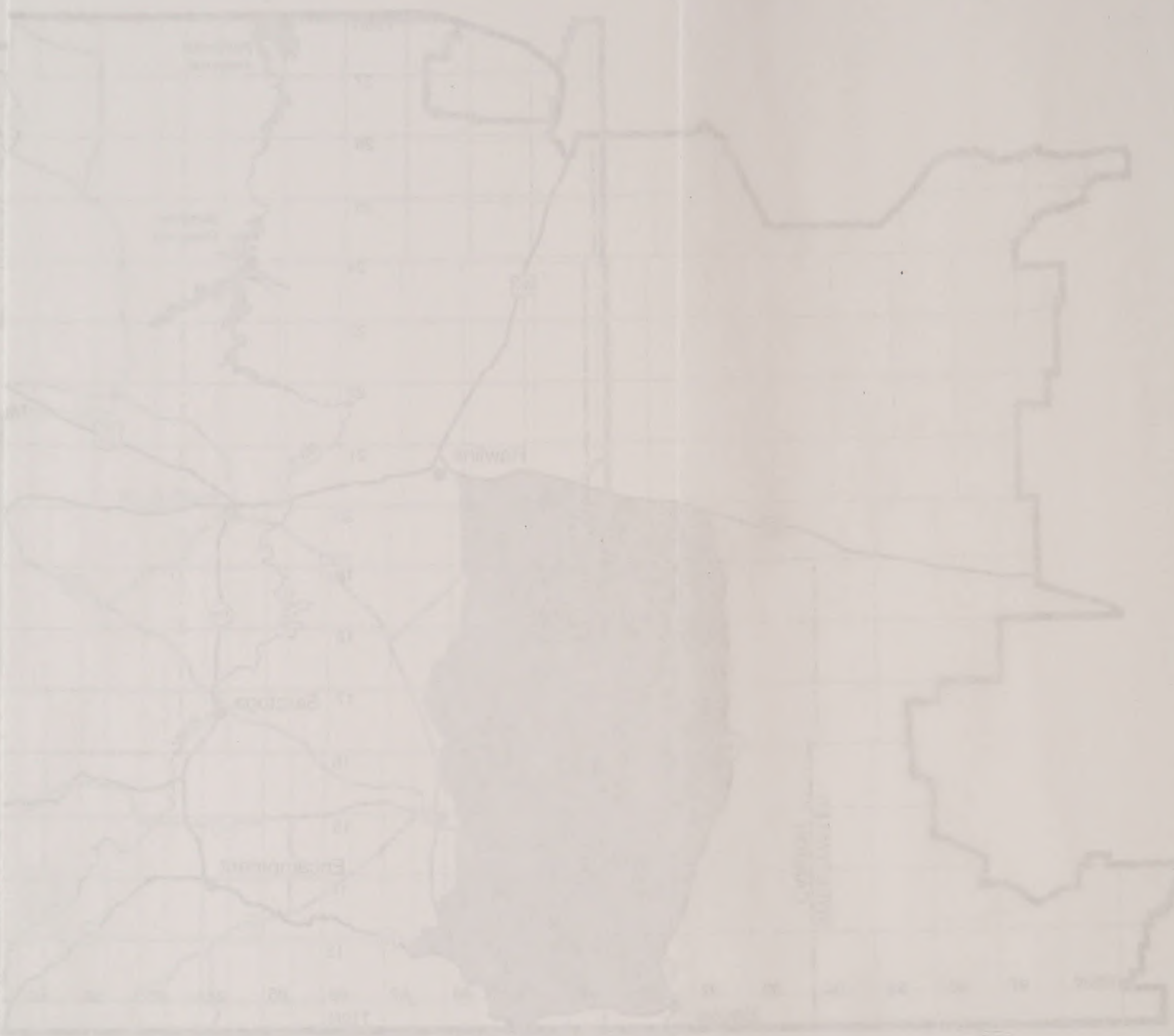
0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 2-57

Greater Sage-Grouse Nesting Limitation Area for Oil and Gas Development

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Forested Lands

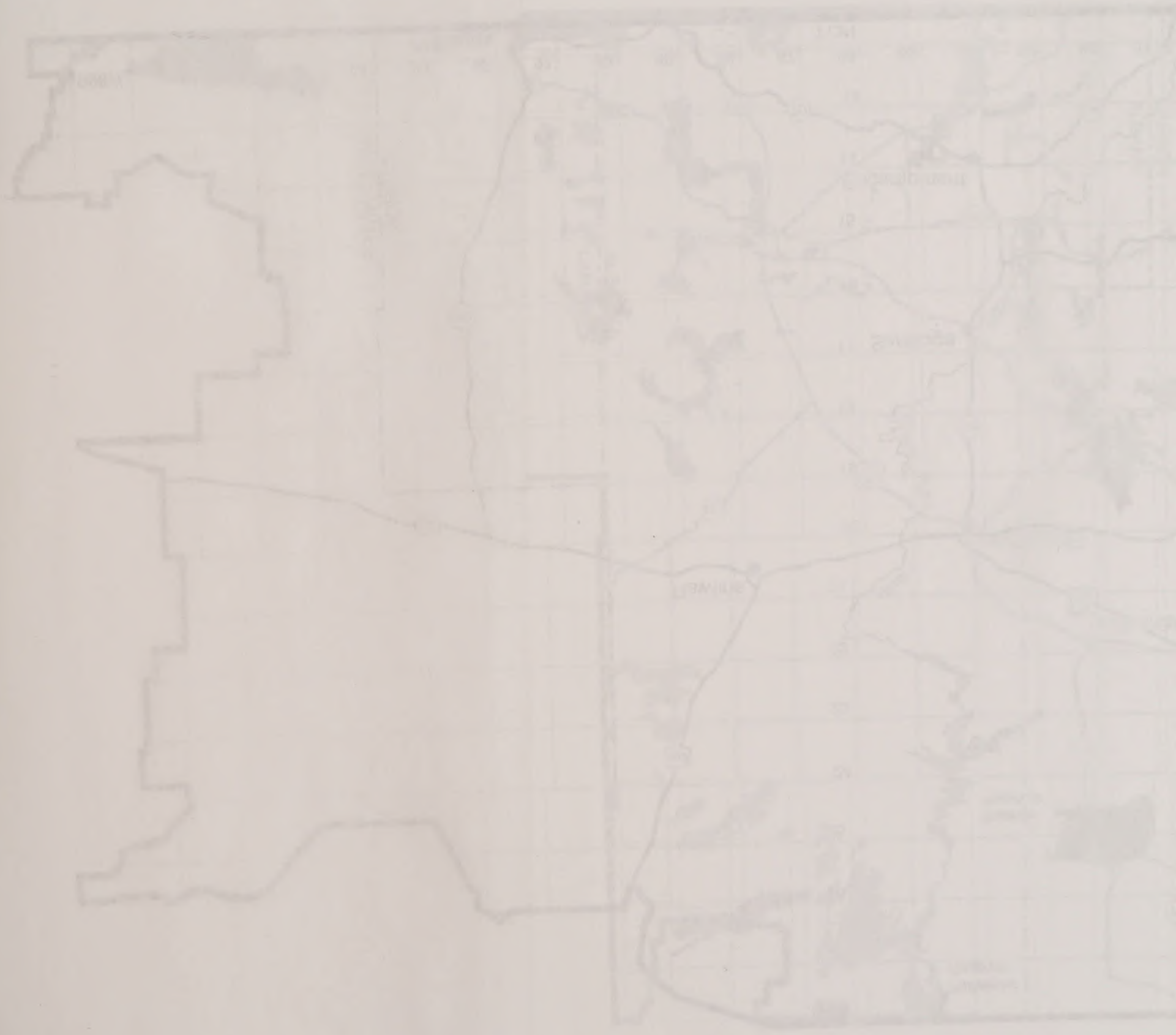
Forested Lands with Potential for Commercial Harvest

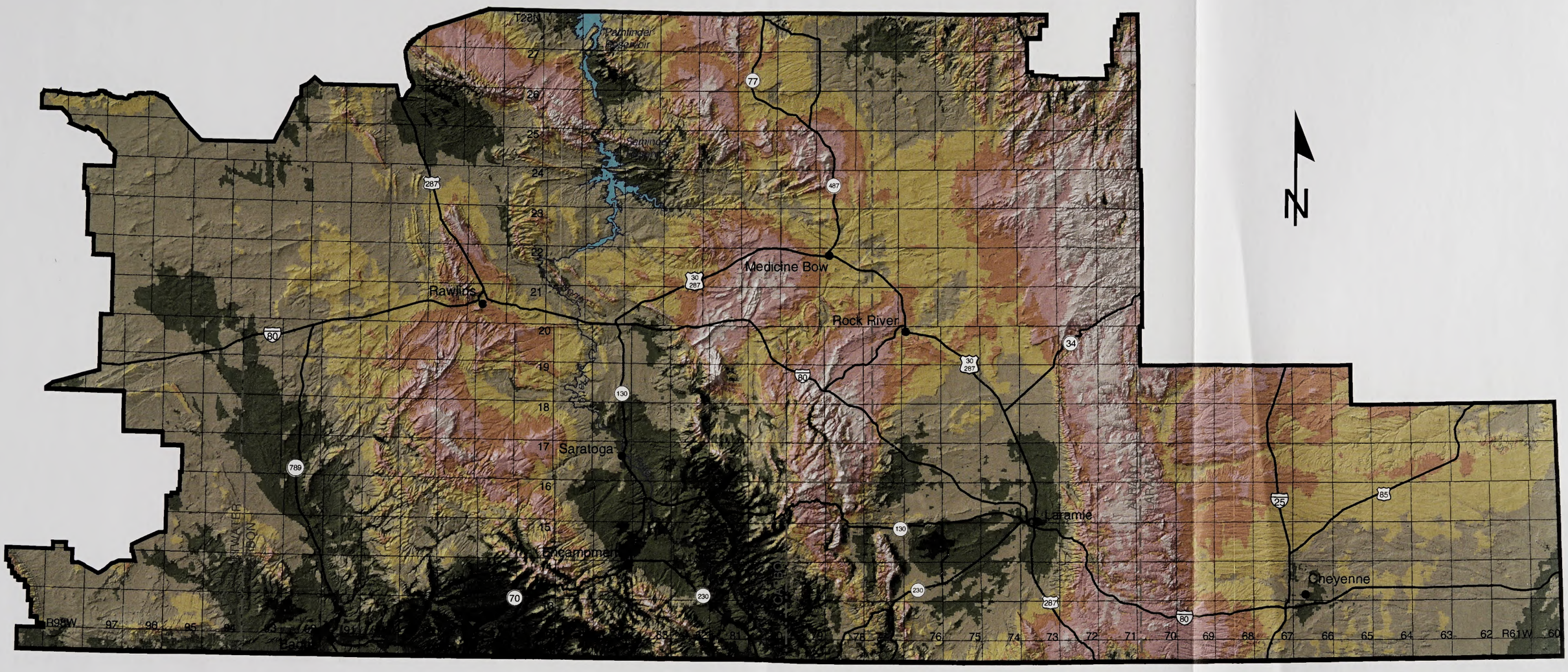
0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 3-1
Forest Management

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





- 1 - Poor
- 2 - Marginal
- 3 - Fair
- 4 - Good
- 5 - Excellent
- 6 - Outstanding
- 7 - Superb

0 10 20 40 60 80 100
Kilometers

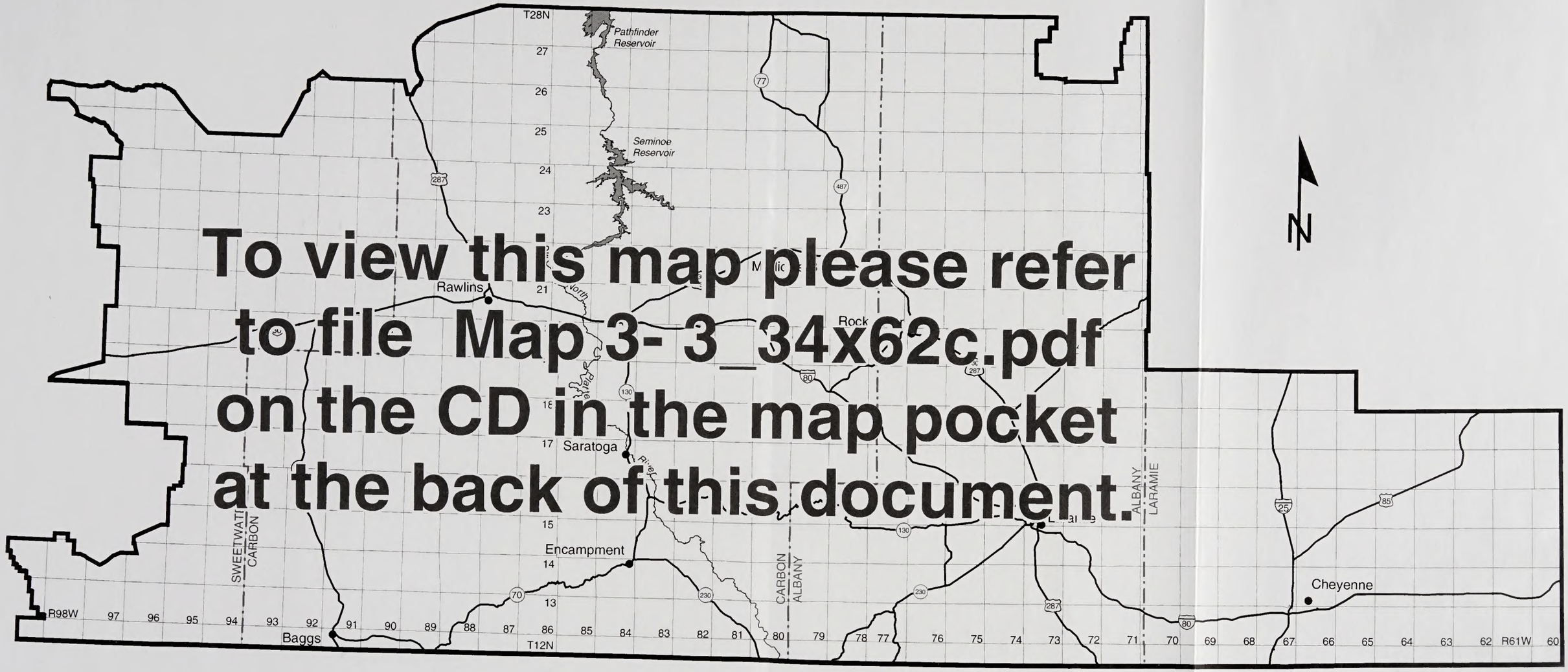
0 5 10 20 30 40 50
Miles

Source: NREL (National Renewable Energy Laboratory), 2004

Map 3-2
Wind Energy Potential

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





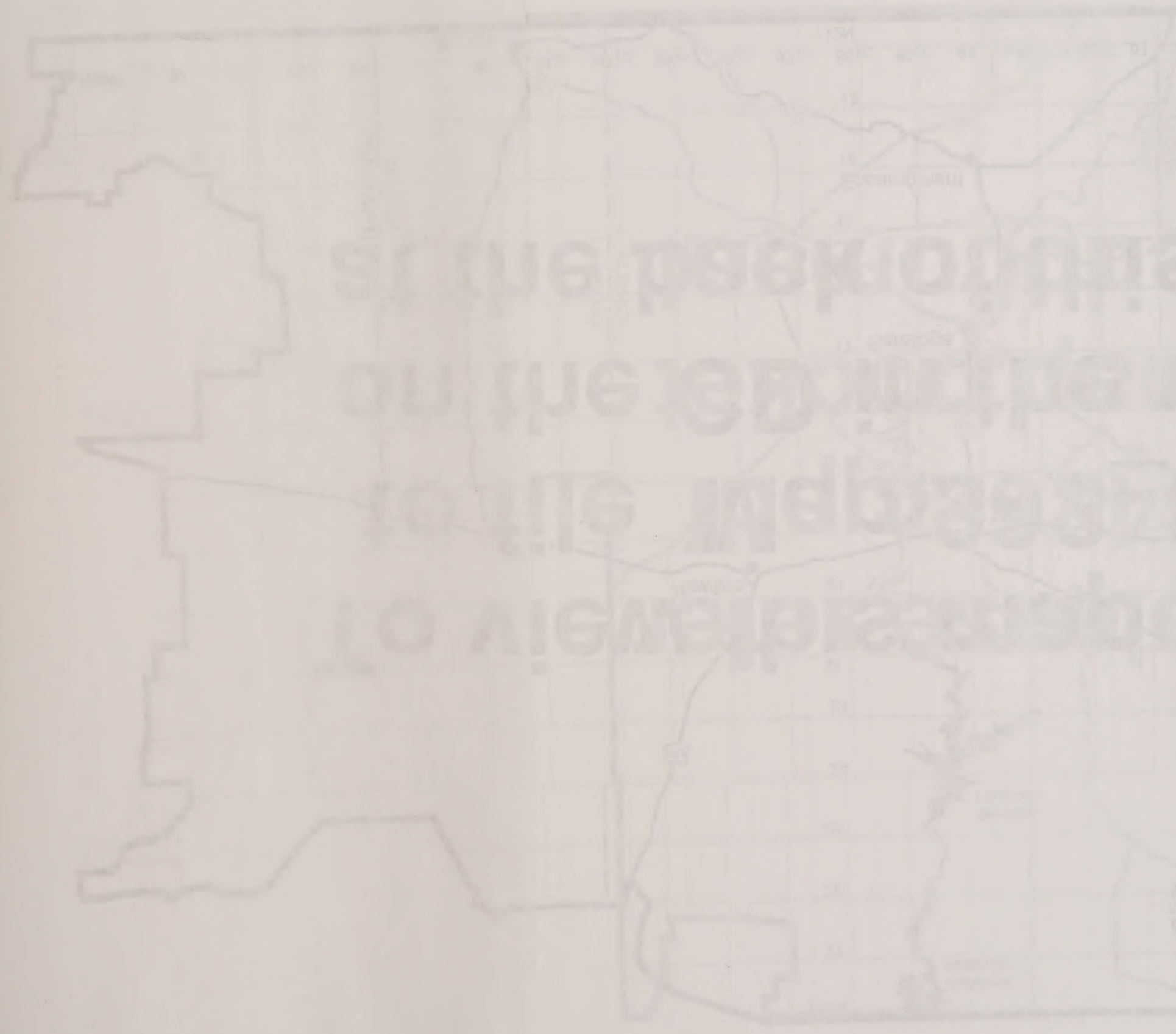
To view this map please refer to file Map 3- 3_34x62c.pdf on the CD in the map pocket at the back of this document.

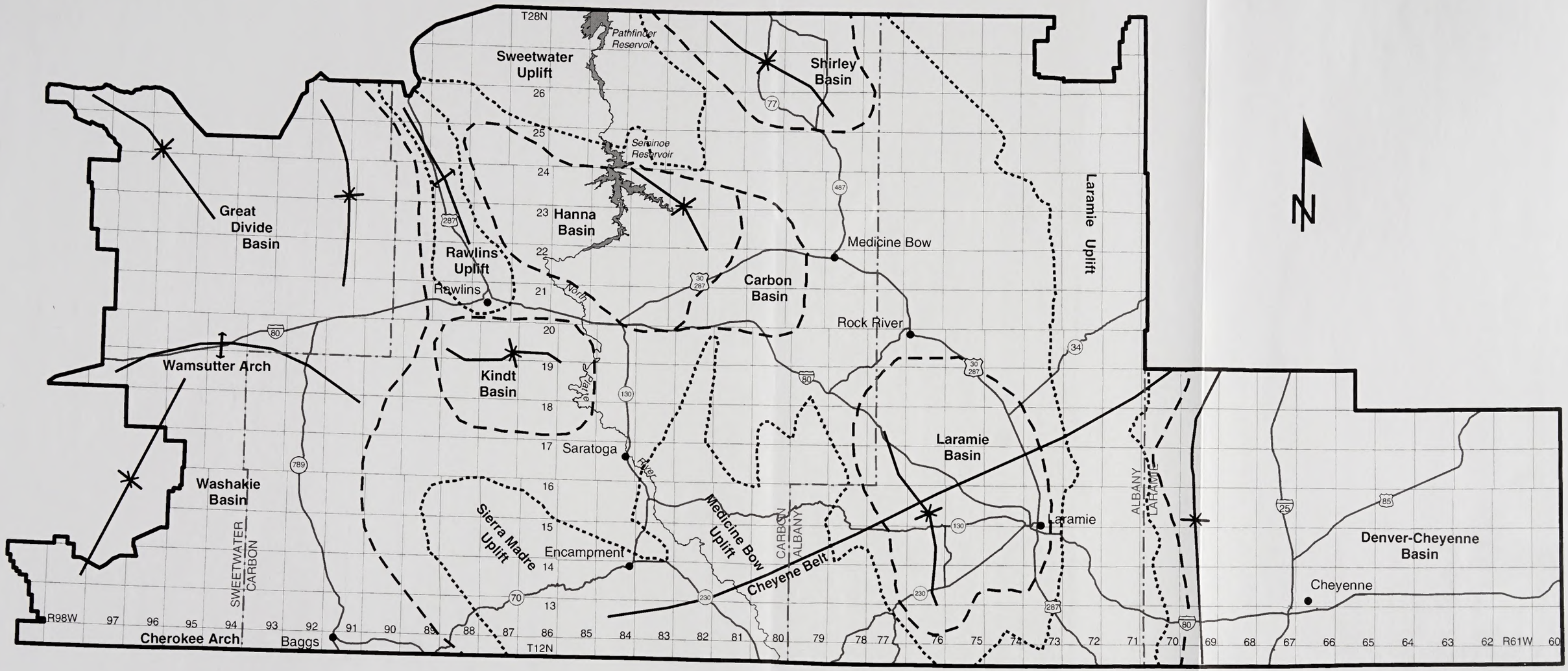
0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 3-3
Grazing Allotments

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Geologic Feature

- Anticline
- Syncline
- Cheyenne Belt
- Basin Boundary
- Uplift Boundary

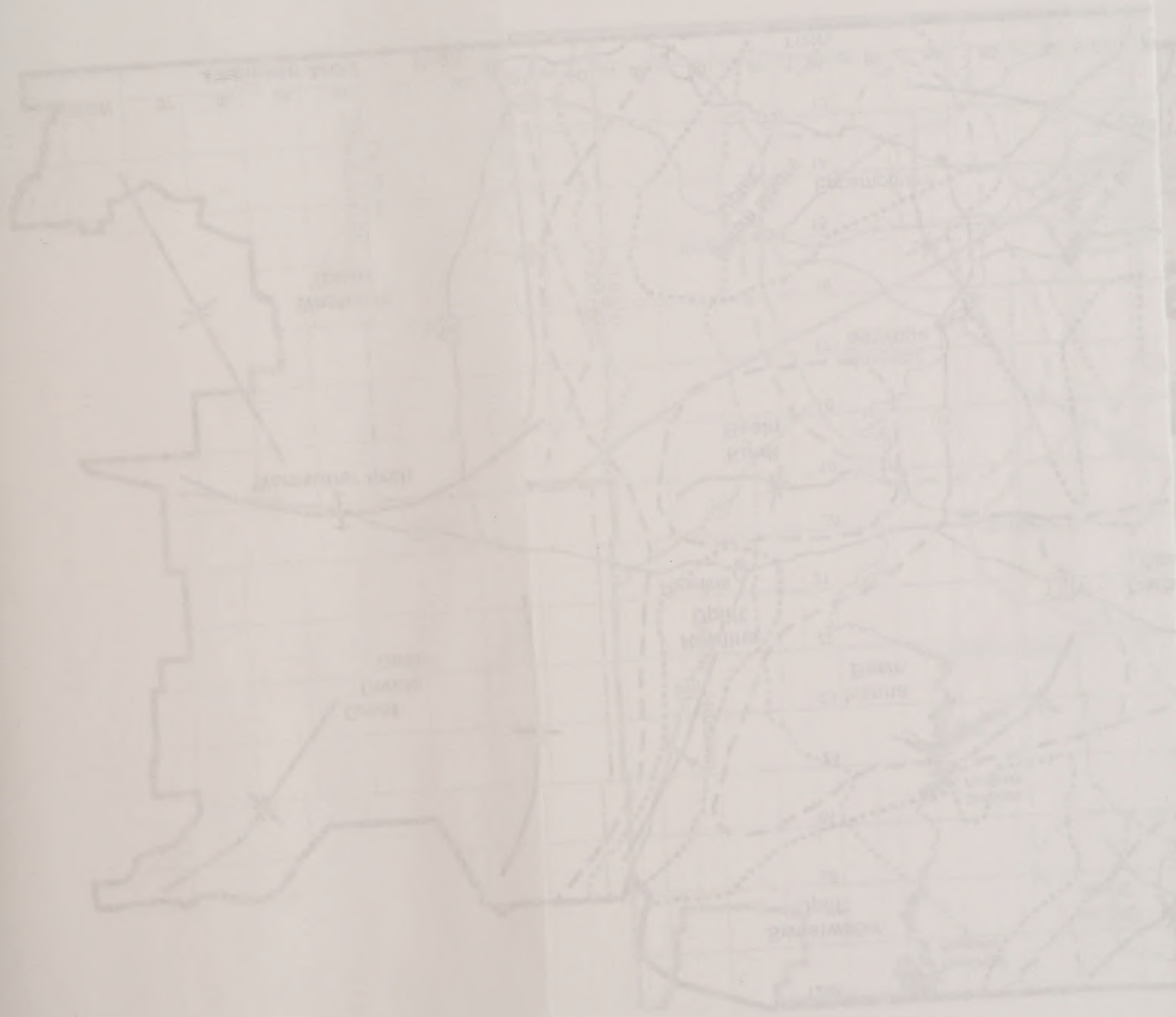
0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 3-4

Major Structural Elements

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Oil and Gas Fields

0 10 20 40 60 80 100
Kilometers

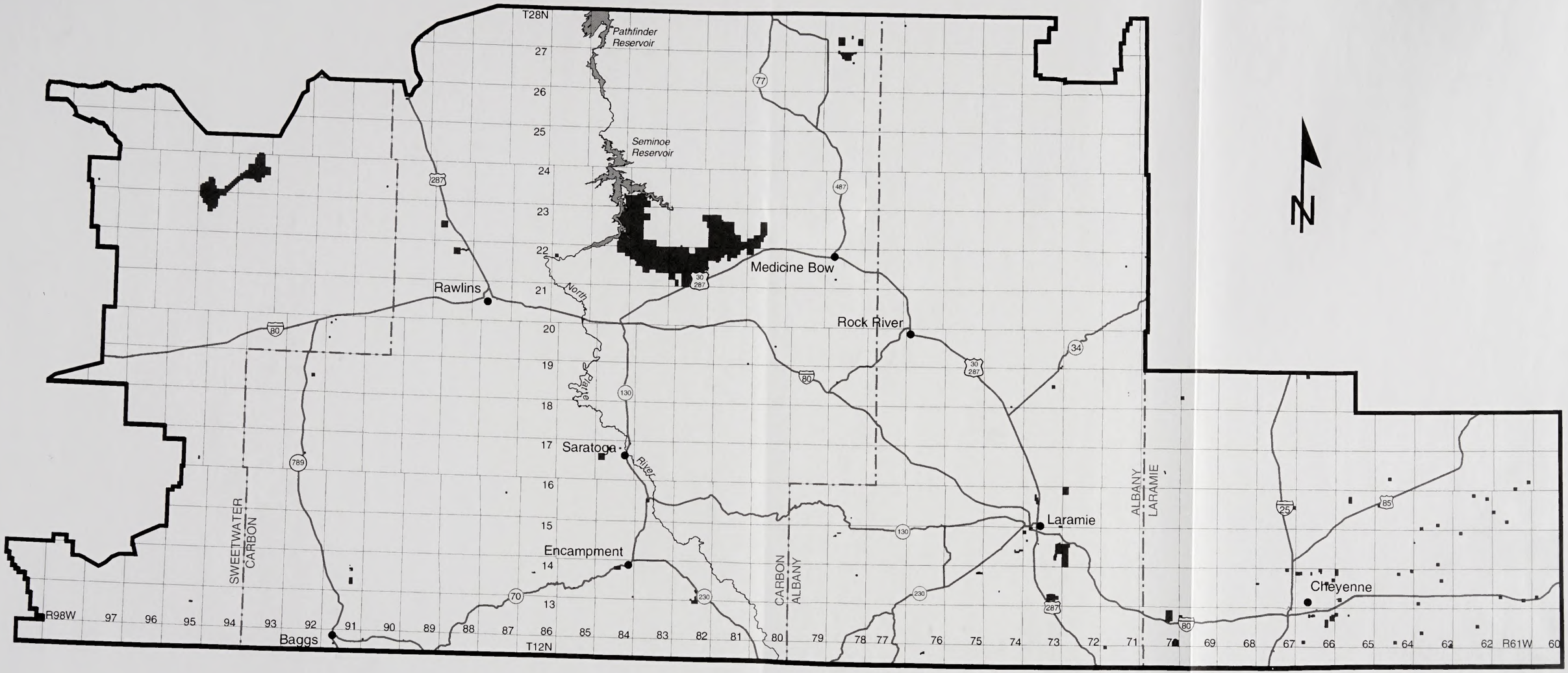
0 5 10 20 30 40 50
Miles

Map 3-5

Oil and Gas Fields

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Permitted Mining Activities

0 10 20 40 60 80 100
Kilometers

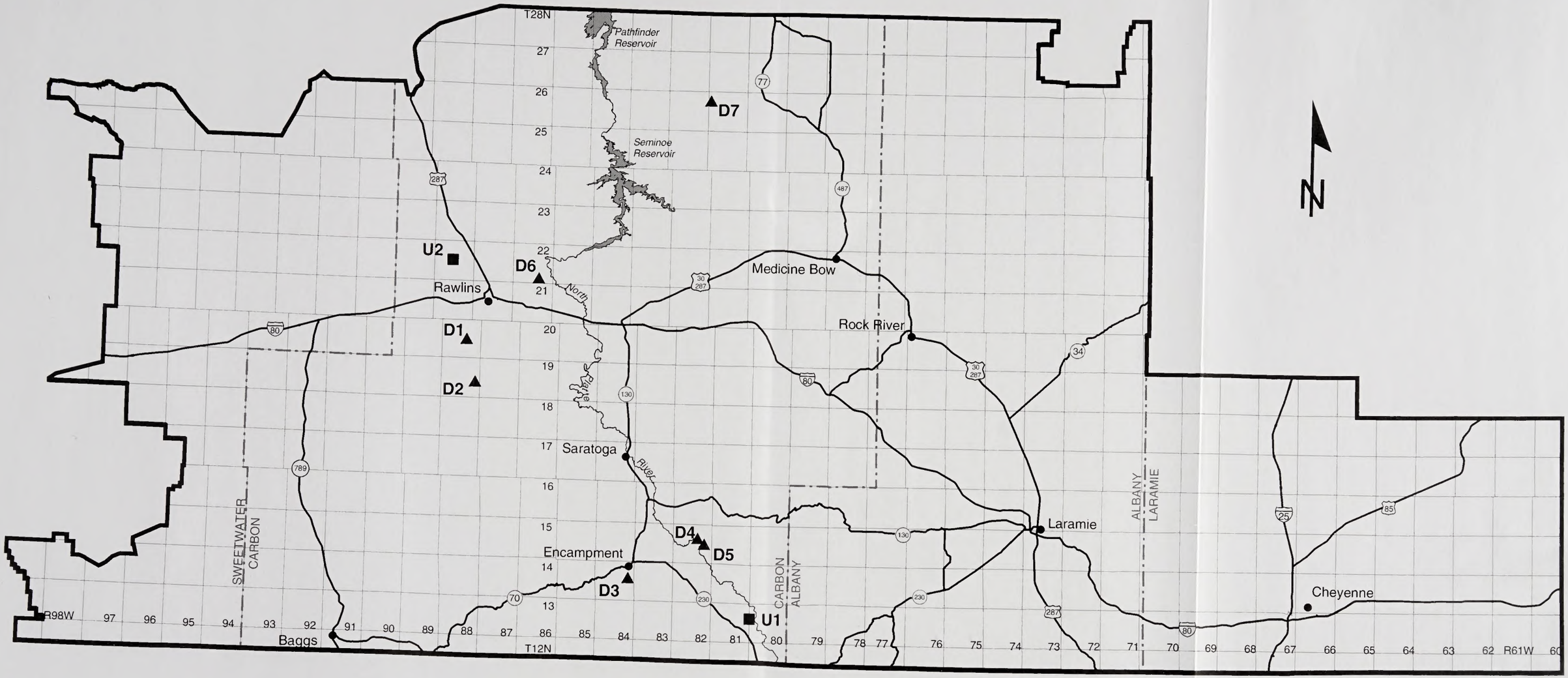
0 5 10 20 30 40 50
Miles

Map 3-6

Permitted Mining Activities

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





▲ Developed Recreation Sites

- **D1** Rim Lake
- **D2** Teton Reservoir
- **D3** Encampment River
- **D4** Bennett Peak
- **D5** Corral Creek
- **D6** Dugway
- **D7** Prior Flat

■ Undeveloped Recreation Sites

- **U1** Big Creek
- **U2** Nine Mile Hill

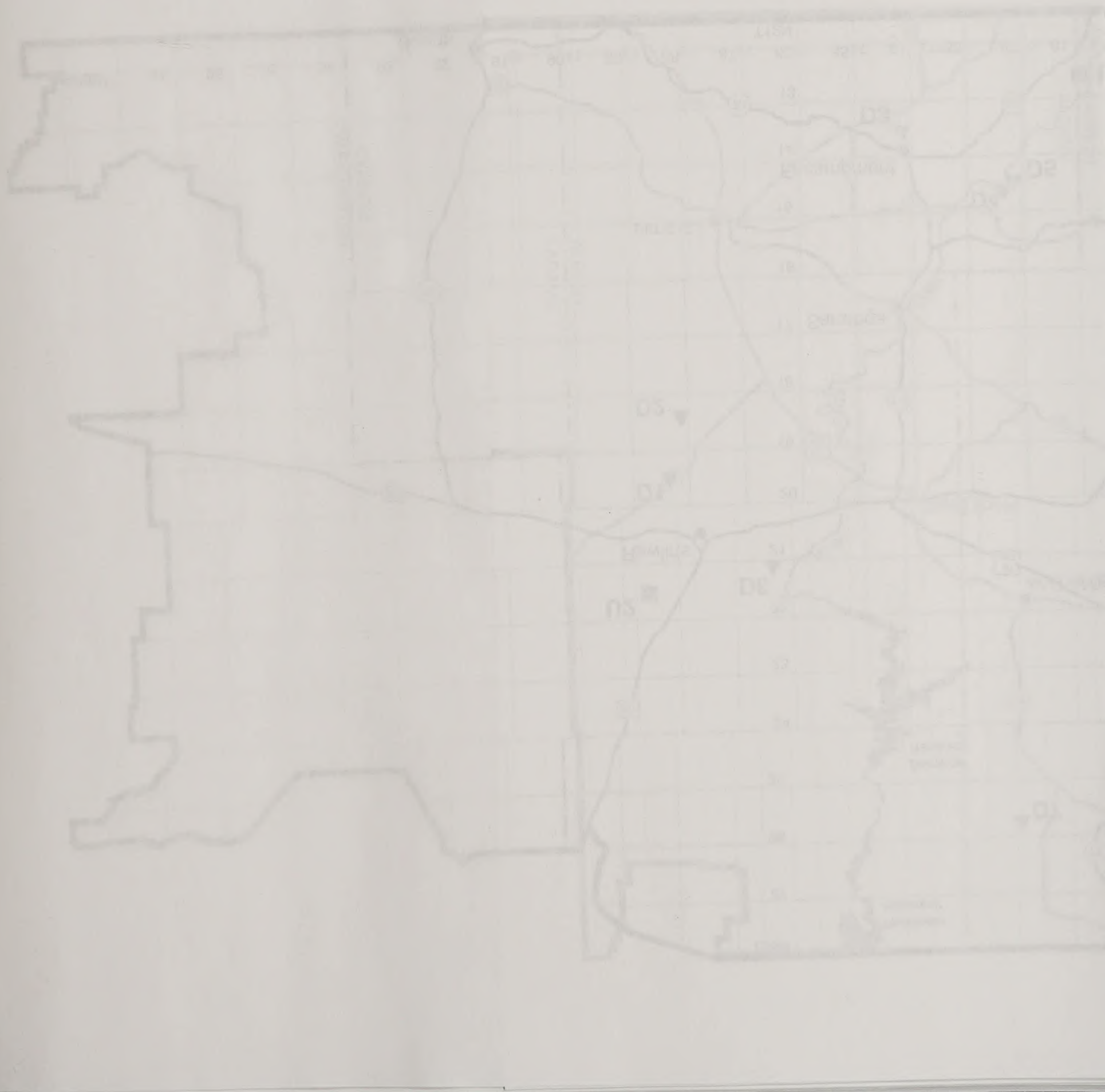
0 10 20 40 60 80 100
Kilometers

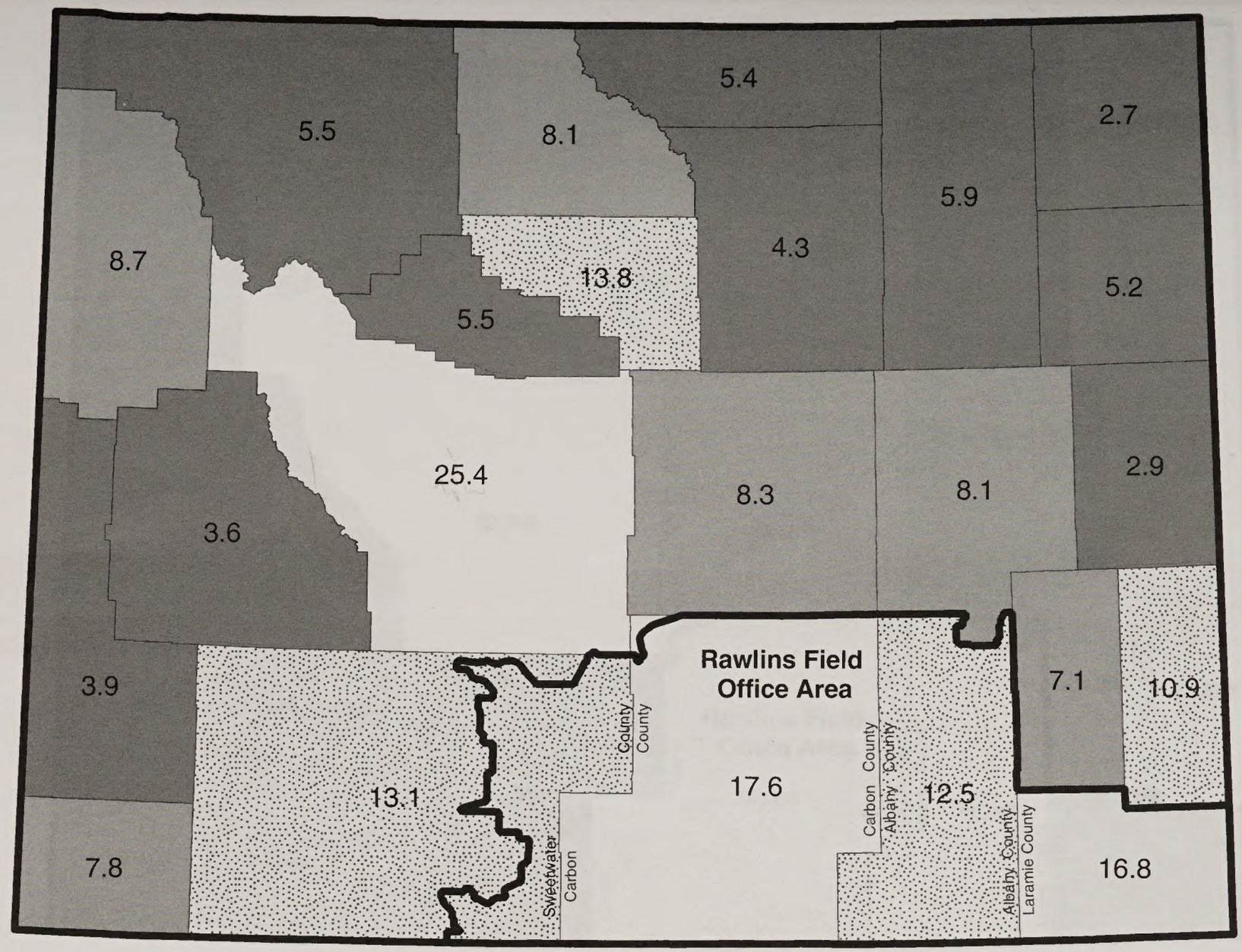
0 5 10 20 30 40 50
Miles

Map 3-7

Recreation Sites

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





2.0% - 6.9%
7.0% - 9.9%
10.0% - 15.9%
16.0% - 26.0%

Statewide = 11.1%

N

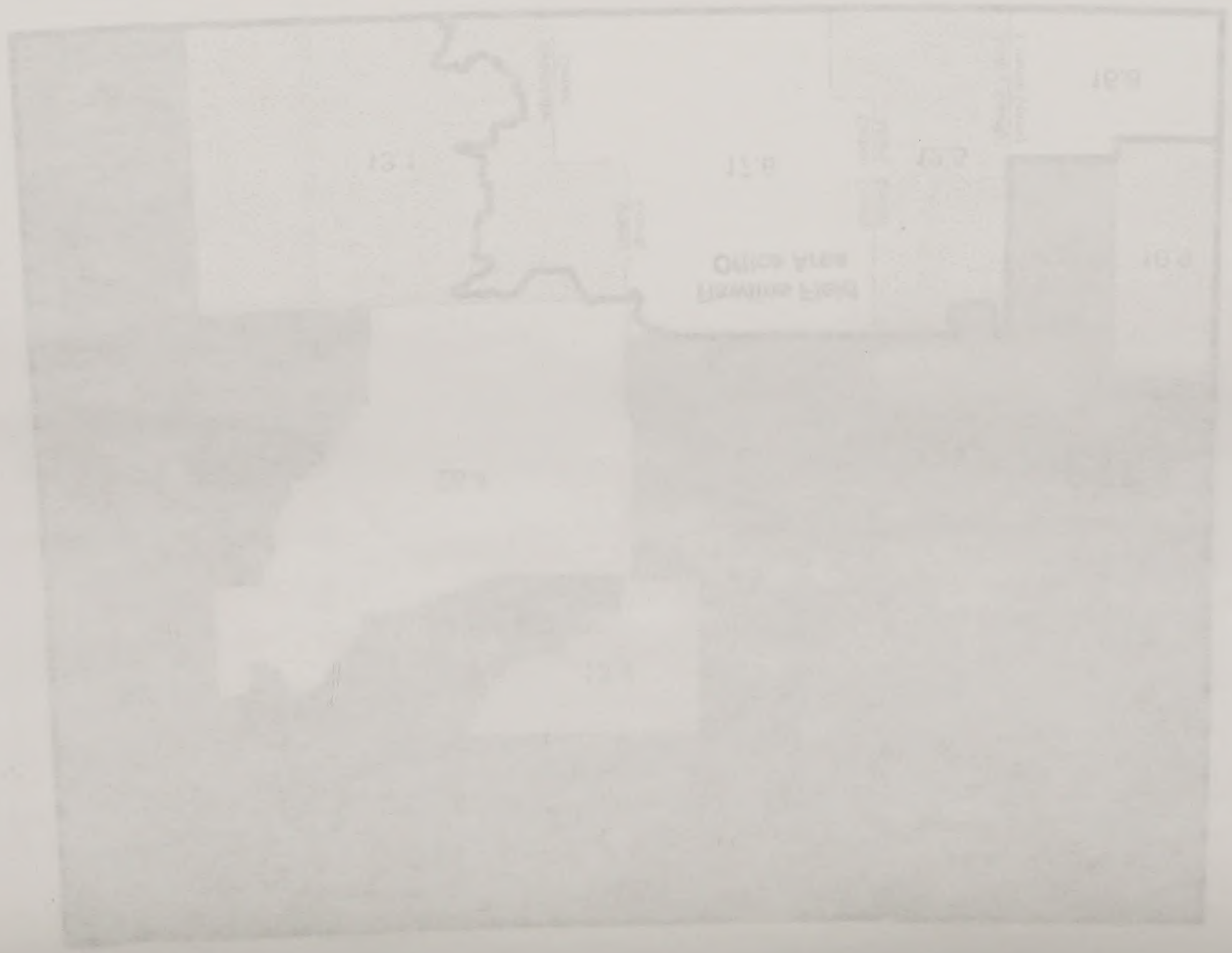
0 20 40 80 120 160 200
Kilometers
0 10 20 40 60 80 100
Miles

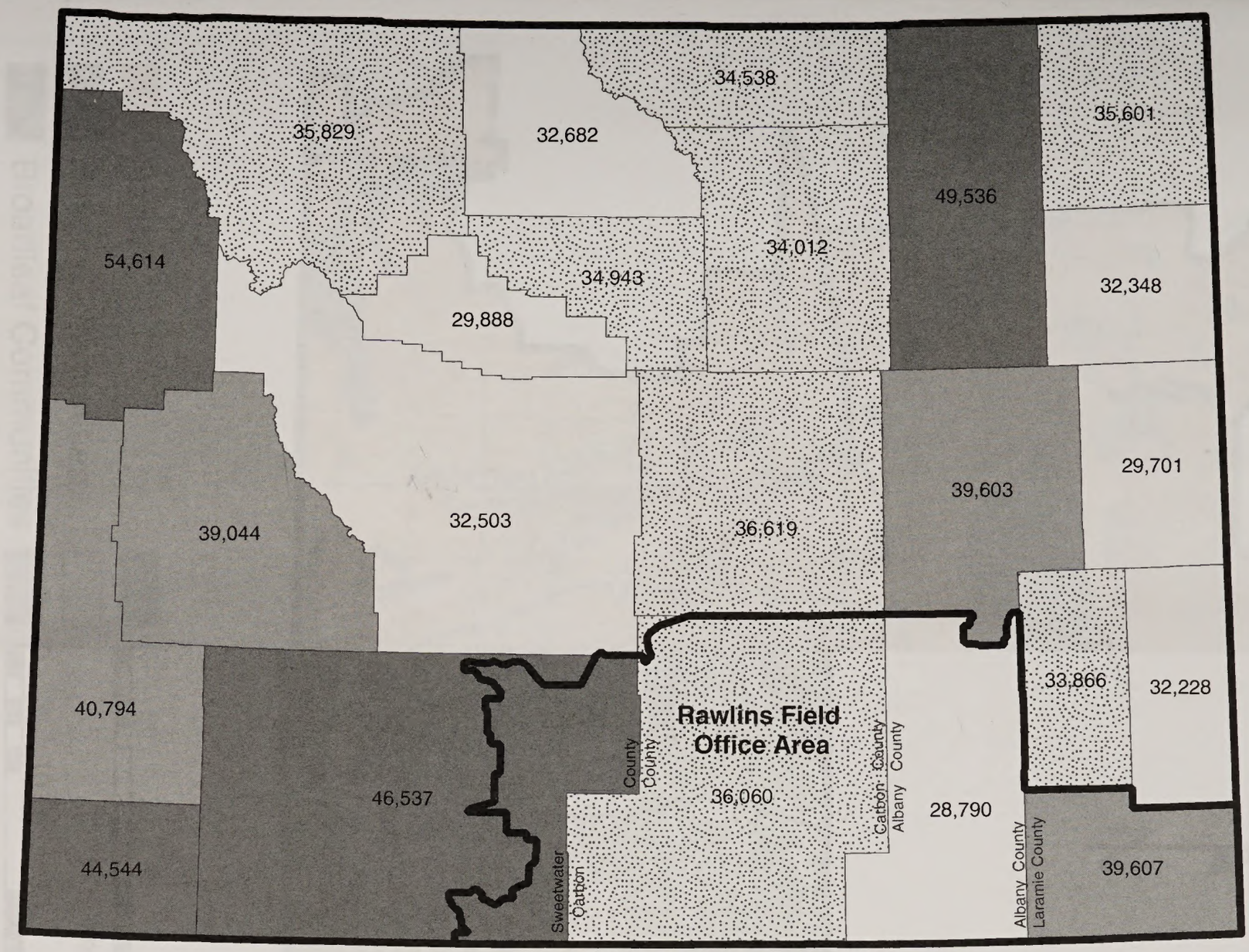
Source: US Census Bureau, 2000

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM

Map 3-8

Percent of Minority Population by County





$28,500 - $33,000
$33,500 - $37,000
$39,000 - $41,000
$44,000 - $55,000

U.S. = $41,994
Wyoming = $37,892

N

0 20 40 80 120 160 200
Kilometers
0 10 20 40 60 80 100
Miles

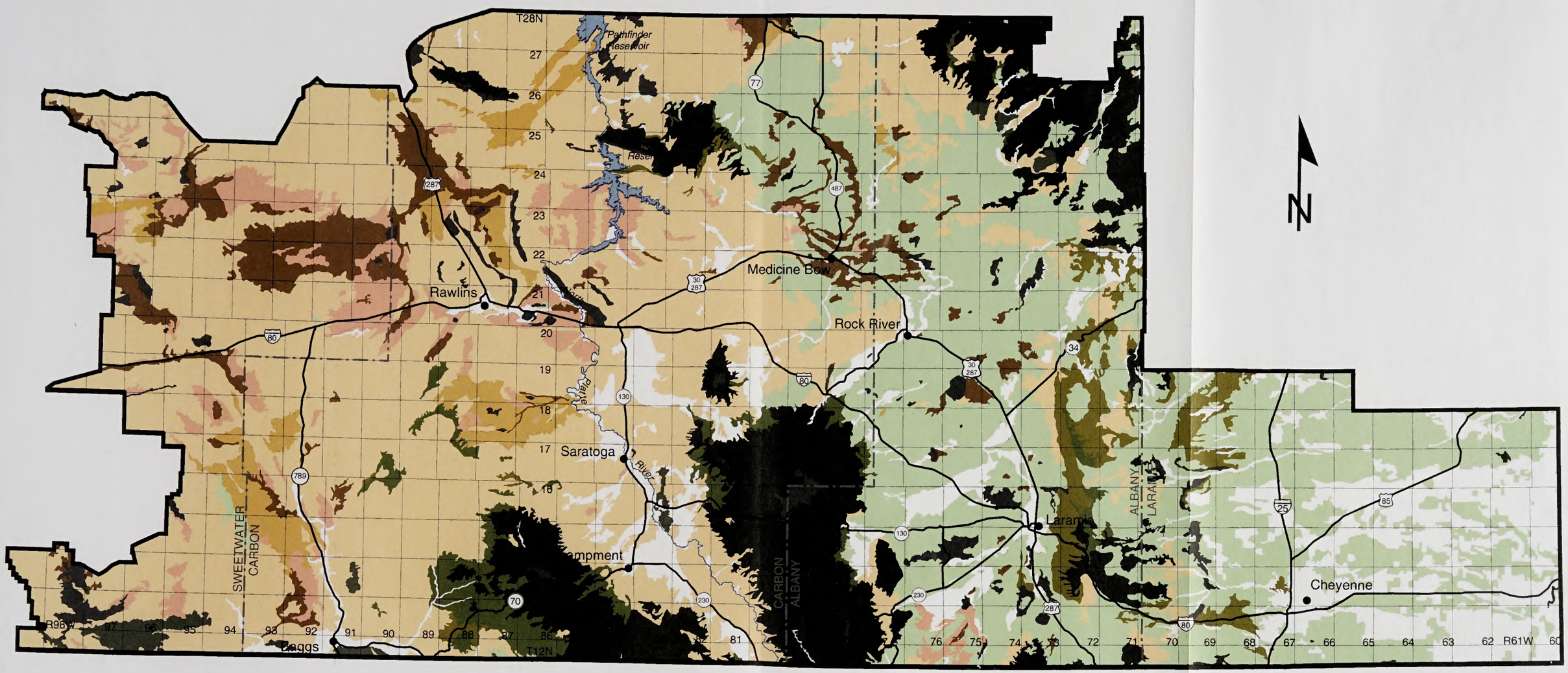
Source: US Census Bureau, 2000

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Map 3-9

Median Household Income





- Sand
- Barren Communities
- Broadleaf Communities
- Mountain Shrub
- Sage Brush
- Salt Brush
- Other Conifer
- Agriculture/Town
- Greasewood
- Juniper Woodland
- Grassland Communities
- Saltbush Fans and Flats

* Vegetation was classified using GAP analysis.

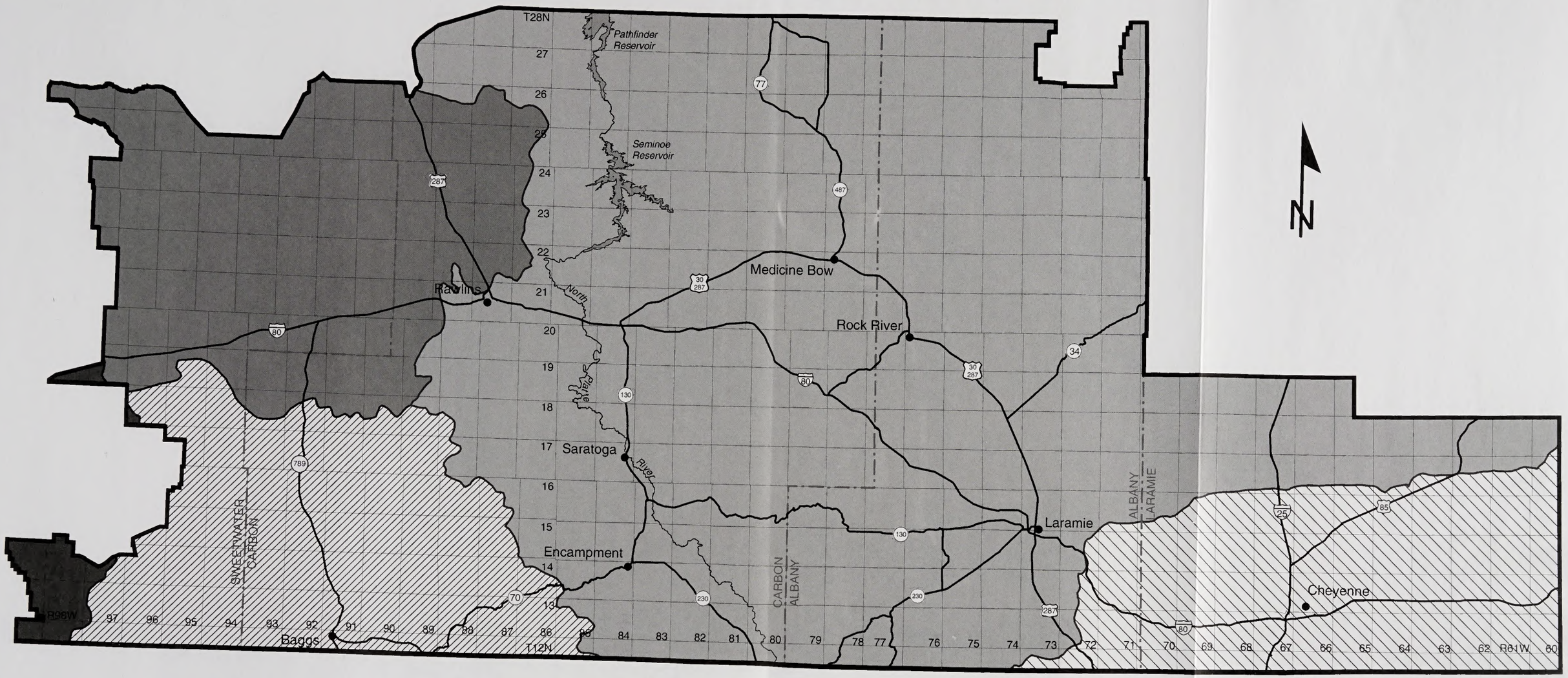
NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 3-10

Vegetation Communities



- Great Divide Closed Basin
- North Platte / Platte River Basin
- South Platte / Platte River Basin
- Upper Green / Colorado River Basin
- White-Yampa / Colorado River Basin

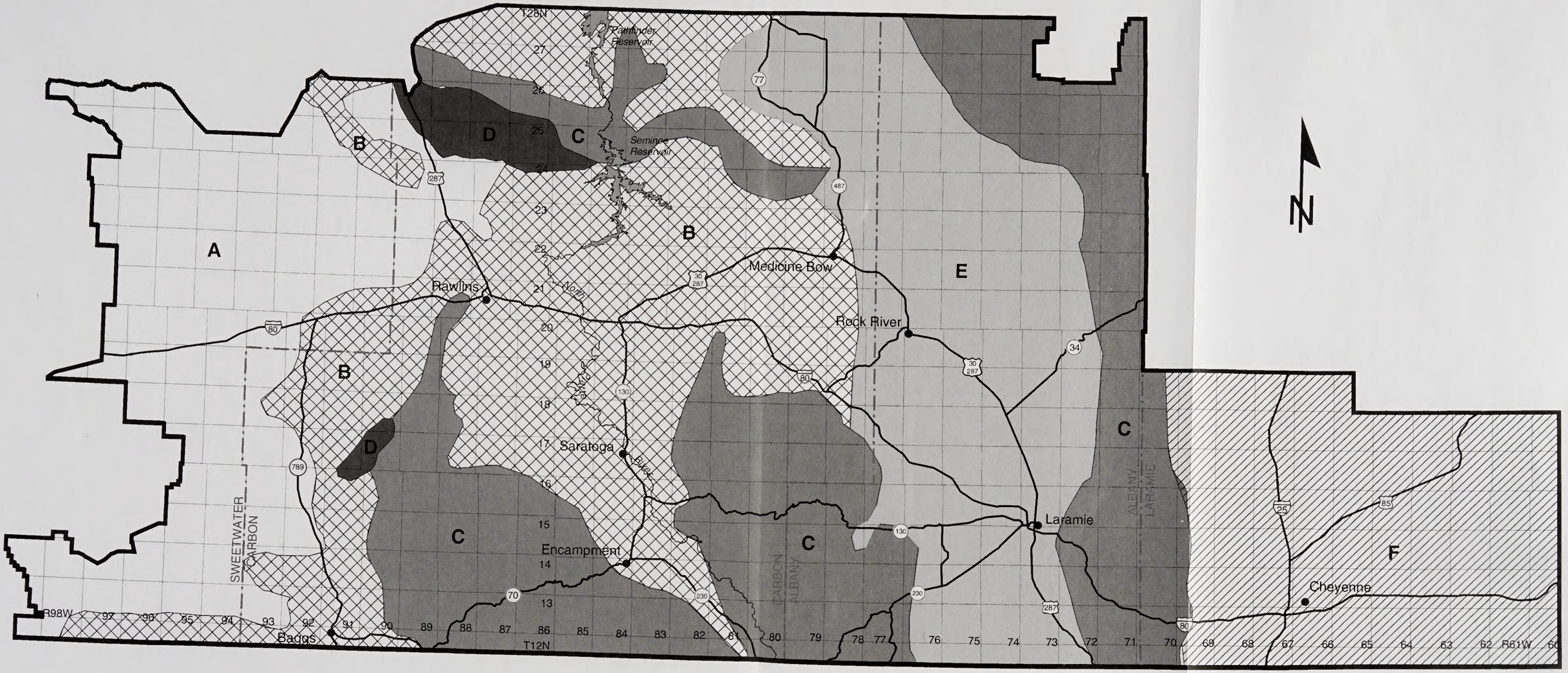
0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 3-11

Major Surface Water Basins

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM



- A Basin Soils (7 - 9 in. Precipitation Zone)
- B Mid-Elevation Soils (10 - 14 in. Precipitation Zone, West)
- C High Elevation Soils (15 - 19 in. Precipitation Zone)
- D Stabilized Dunes (10 - 14 in. Precipitation Zone)
- E Mid-Elevation Soils (10 - 14 in. Precipitation Zone, East)
- F Lower Elevation Soils (15 - 17 in. Precipitation Zone)

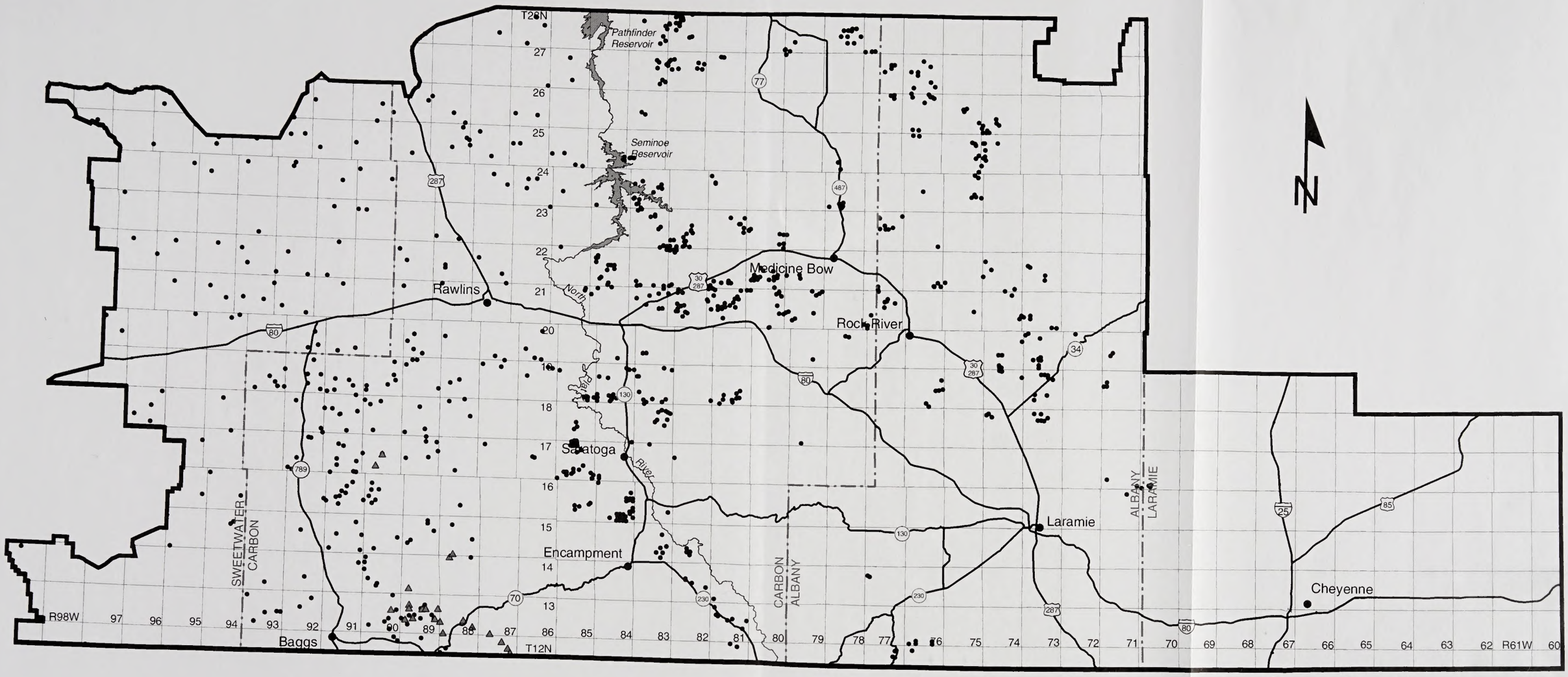
0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map 3-12

Soil/Precipitation Zones

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM



▲ Columbian Sharp-tailed Grouse Leks

• Greater Sage-Grouse Leks

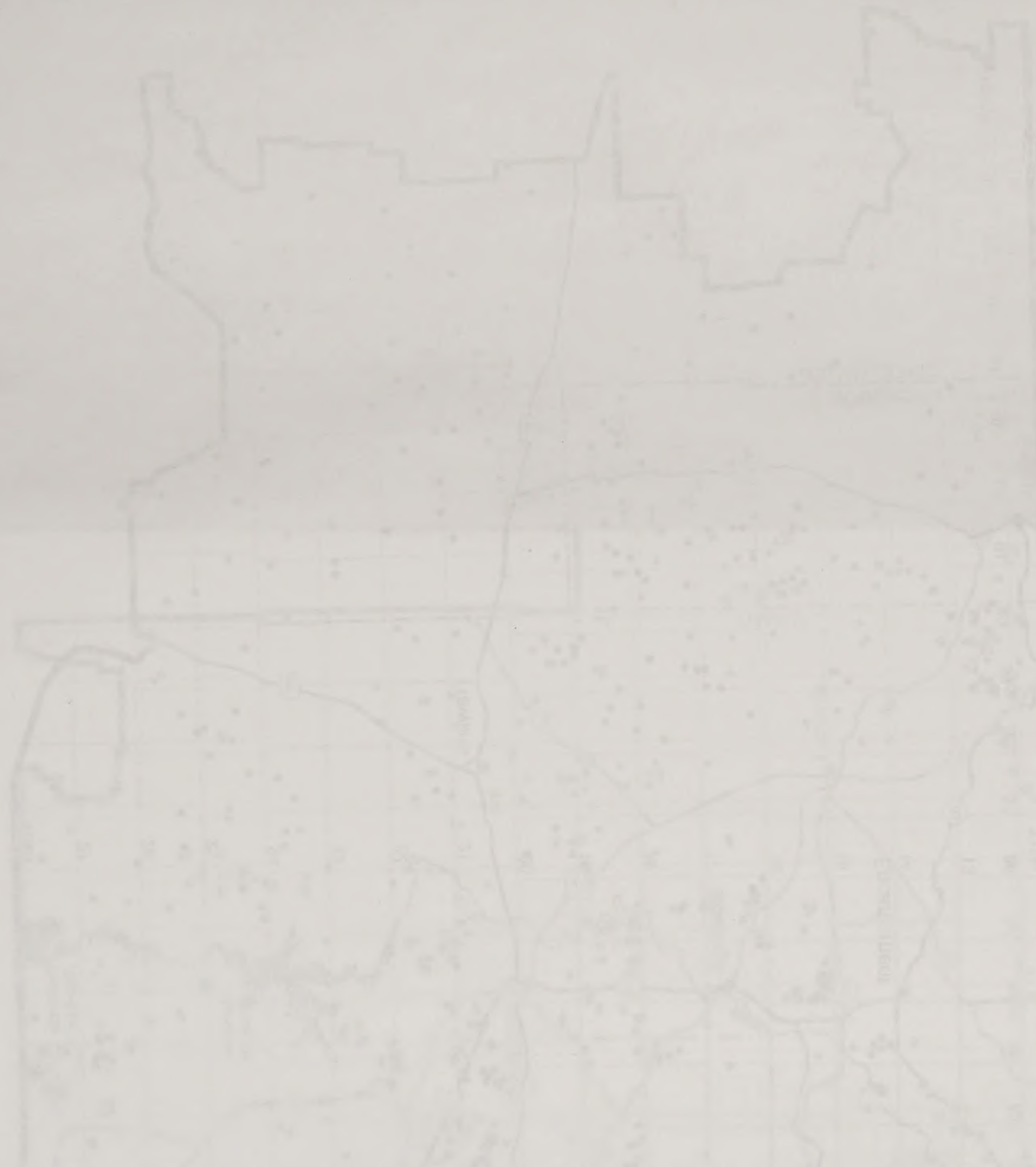
0 10 20 40 60 80 100
Kilometers

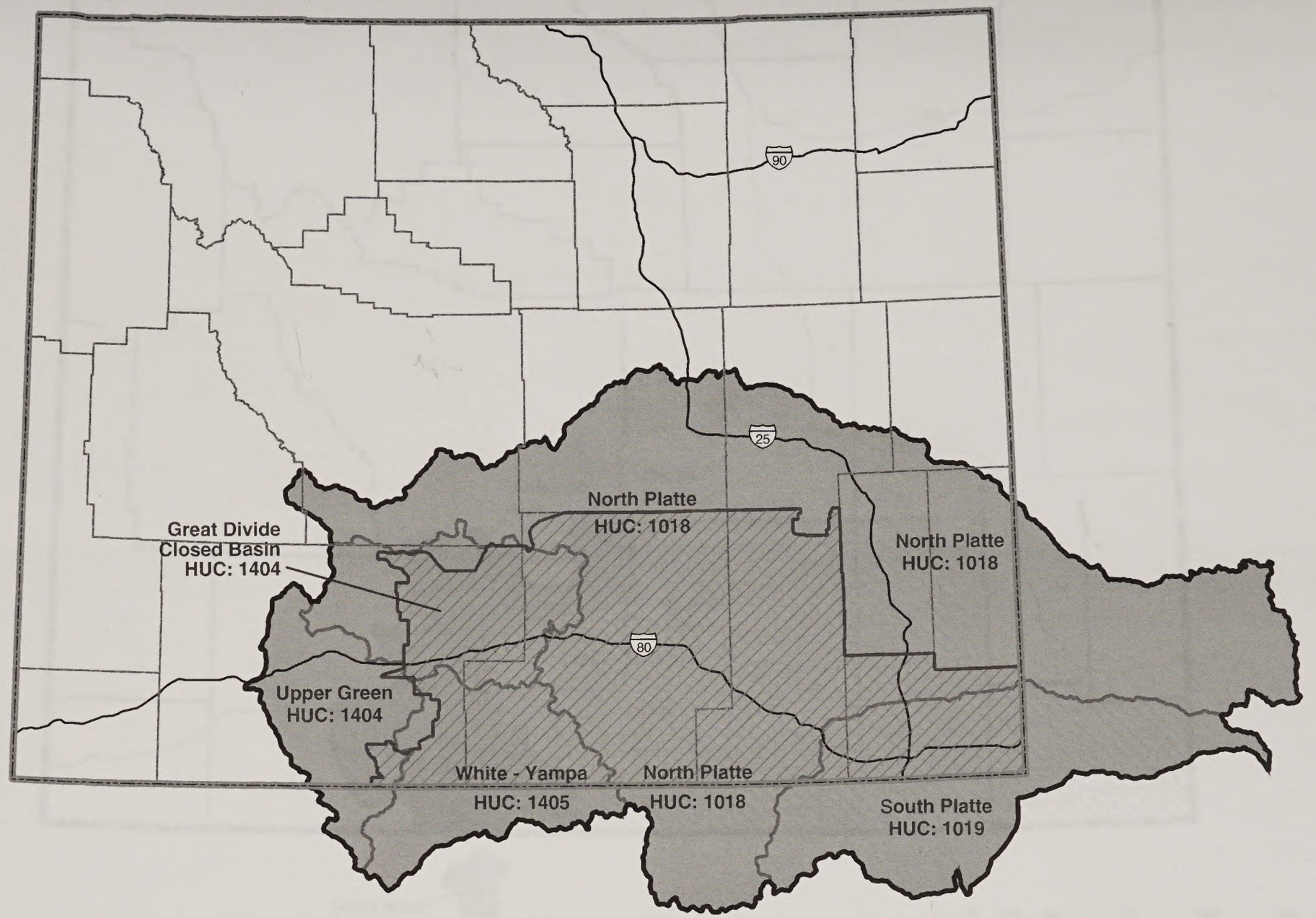
0 5 10 20 30 40 50
Miles

Map 3-13

Greater Sage-Grouse and Columbian Sharp-tailed Grouse Leks

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Water Quality and Watersheds CIAA

Major Surface Water Basins

Rawlins RMPPA

N

0 20 40 80 120 160 200

Kilometers

0 10 20 40 60 80 100

Miles

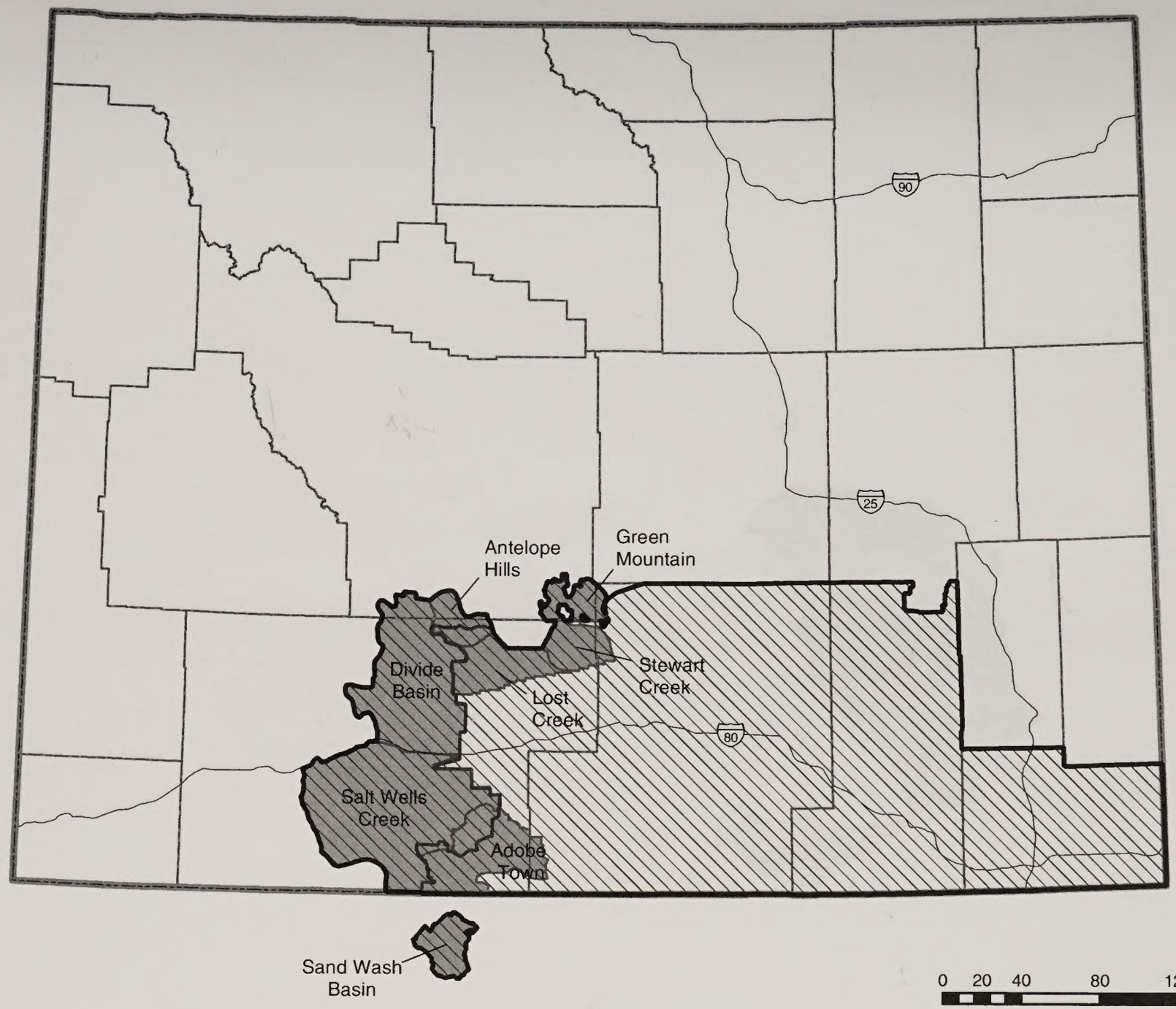
Map 4-1

Water Quality and Watersheds

Cumulative Impact Analysis Area

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NO INTENDED BY BLM





Wild Horses CIAA
Herd Management Areas
Rawlins RMPPA

N

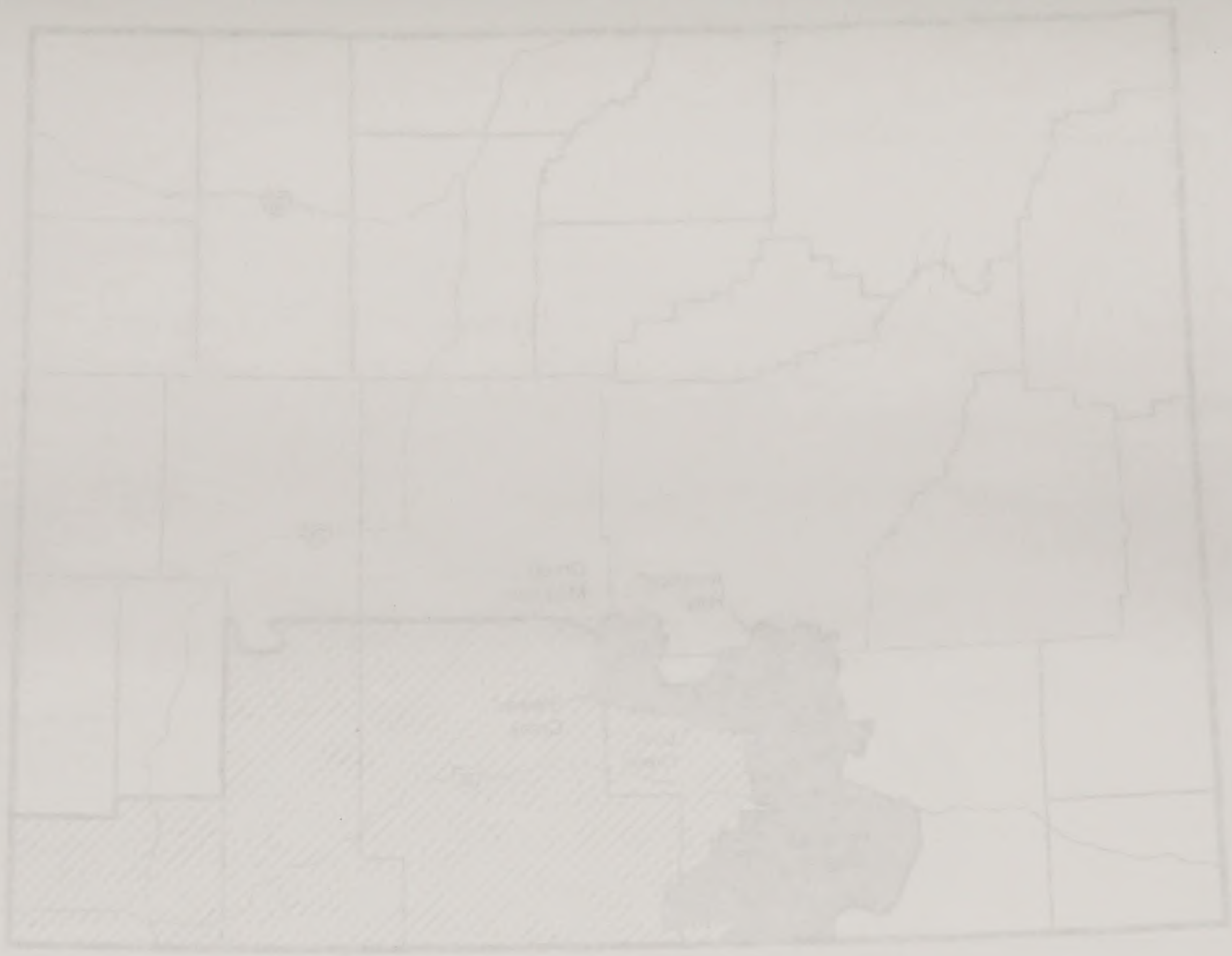
0 20 40 80 120 160 200
Kilometers
0 10 20 40 60 80 100
Miles

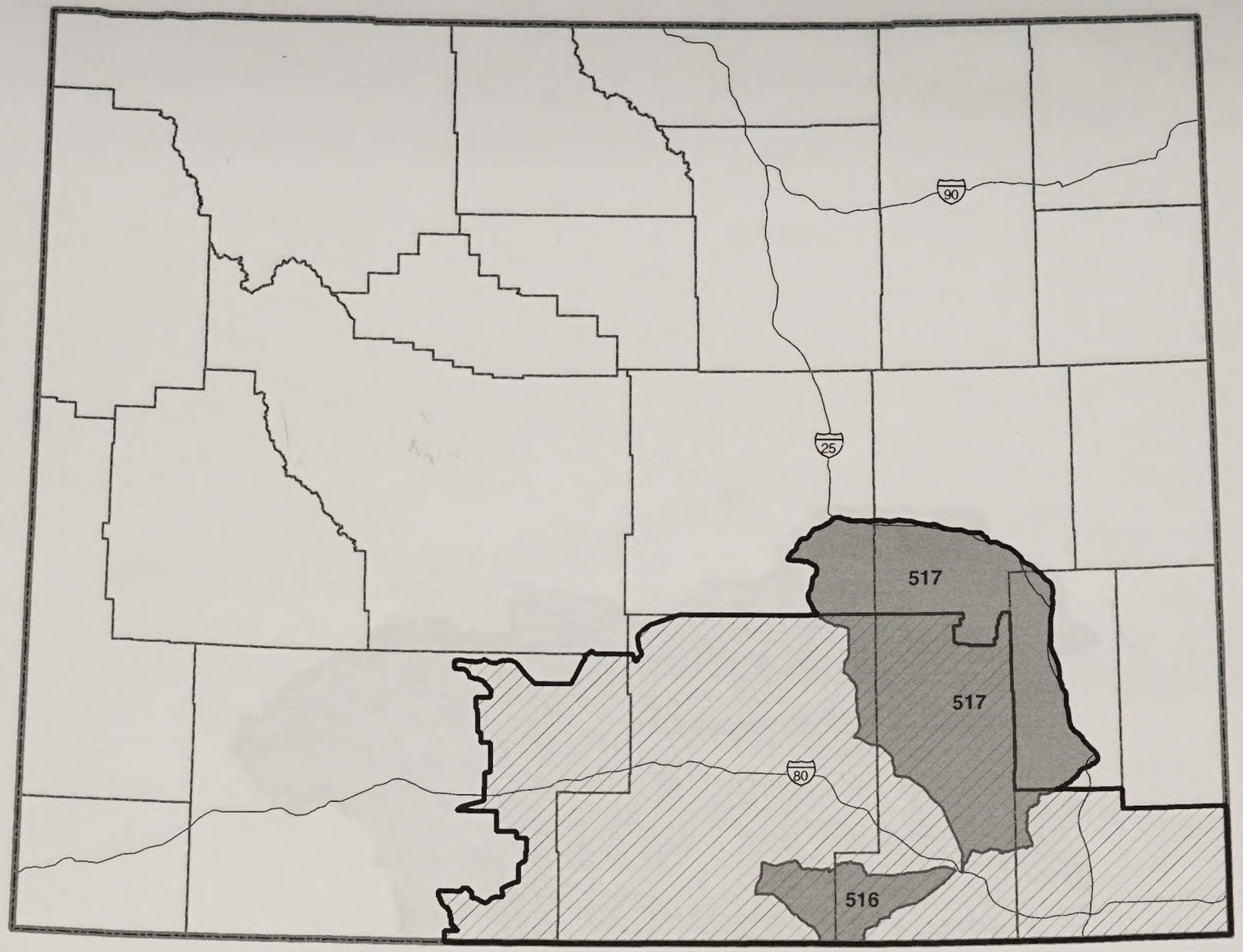
Map 4-2

Wild Horses

Cumulative Impact Analysis Area

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Big Horn Sheep CIAA

516 Big Horn Sheep Herd Areas

Rawlins RMPPA

N

0 20 40 80 120 160 200

Kilometers

0 10 20 40 60 80 100

Miles

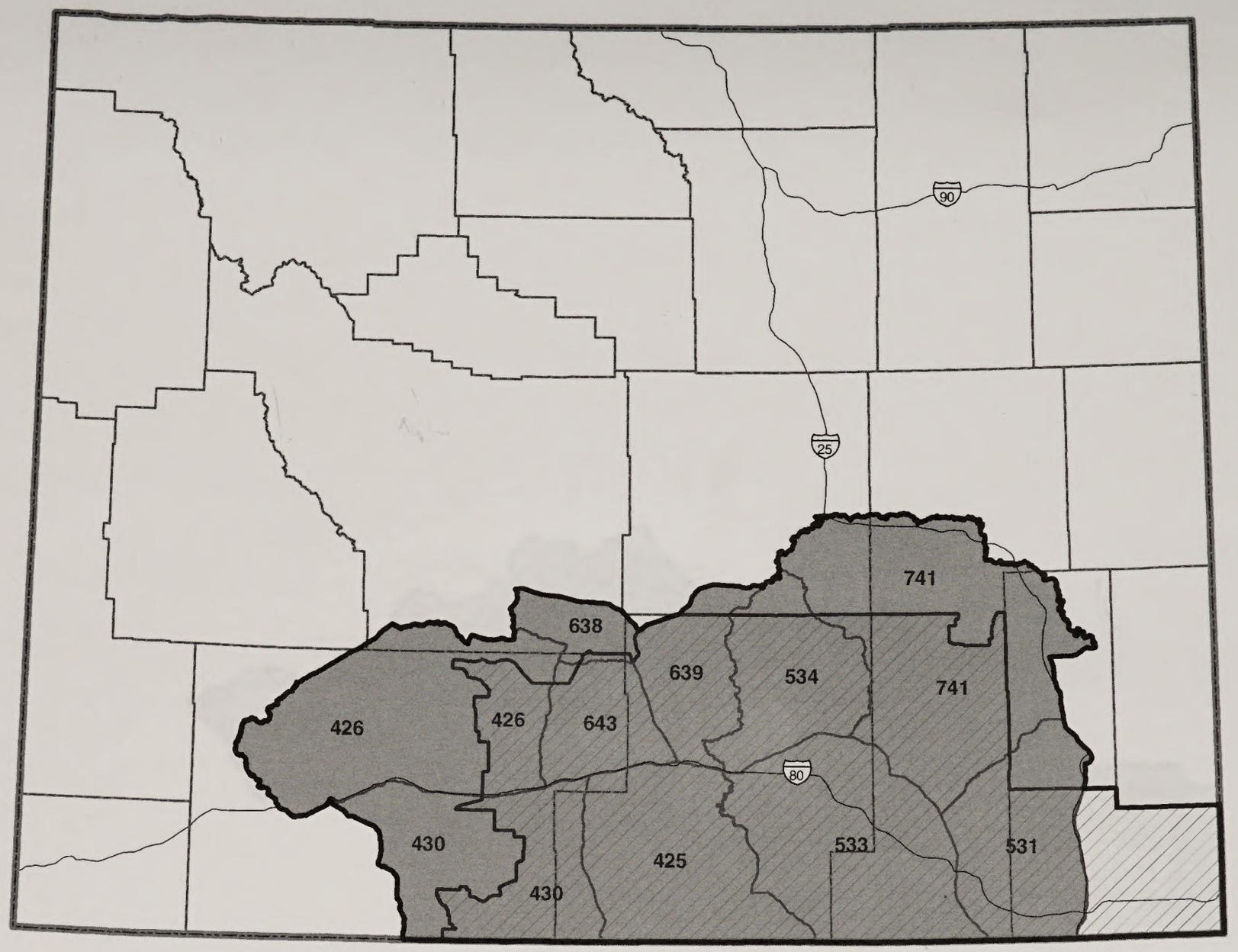
Map 4-3

Bighorn Sheep

Cumulative Impact Analysis Area

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Elk CIAA

430 Elk Herd Areas

Rawlins RMPPA

N

0 20 40 80 120 160 200

Kilometers

0 10 20 40 60 80 100

Miles

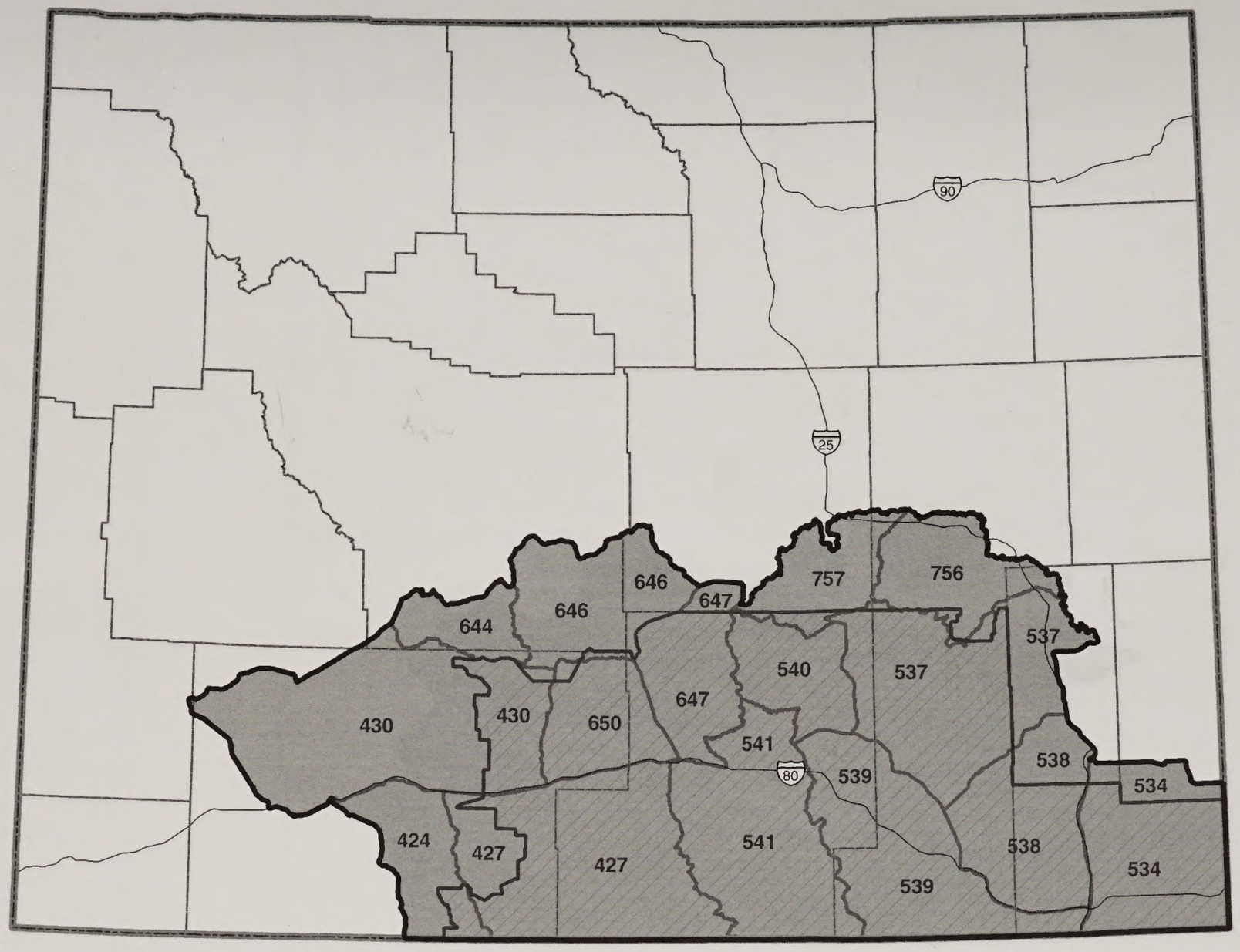
Map 4-4

Elk

Cumulative Impact Analysis Area

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Mule Deer CIAA

424 Mule Deer Herd Areas

Rawlins RMPPA

N

0 20 40 80 120 160 200

Kilometers

0 10 20 40 60 80 100

Miles

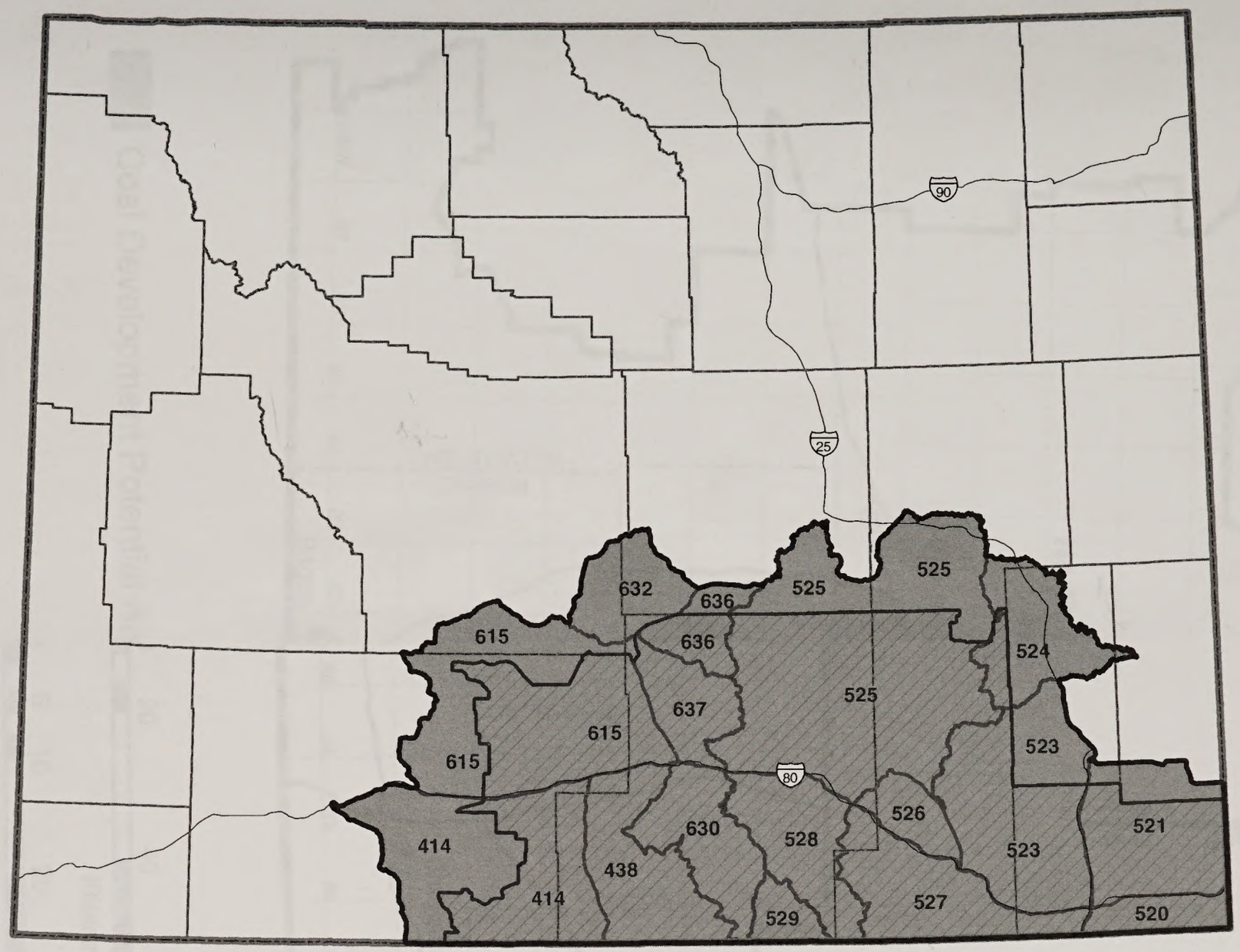
Map 4-5

Mule Deer

Cumulative Impact Analysis Area

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Pronghorn CIAA

414 Pronghorn Herd Areas

Rawlins RMPPA

N

0 20 40 80 120 160 200

Kilometers

0 10 20 40 60 80 100

Miles

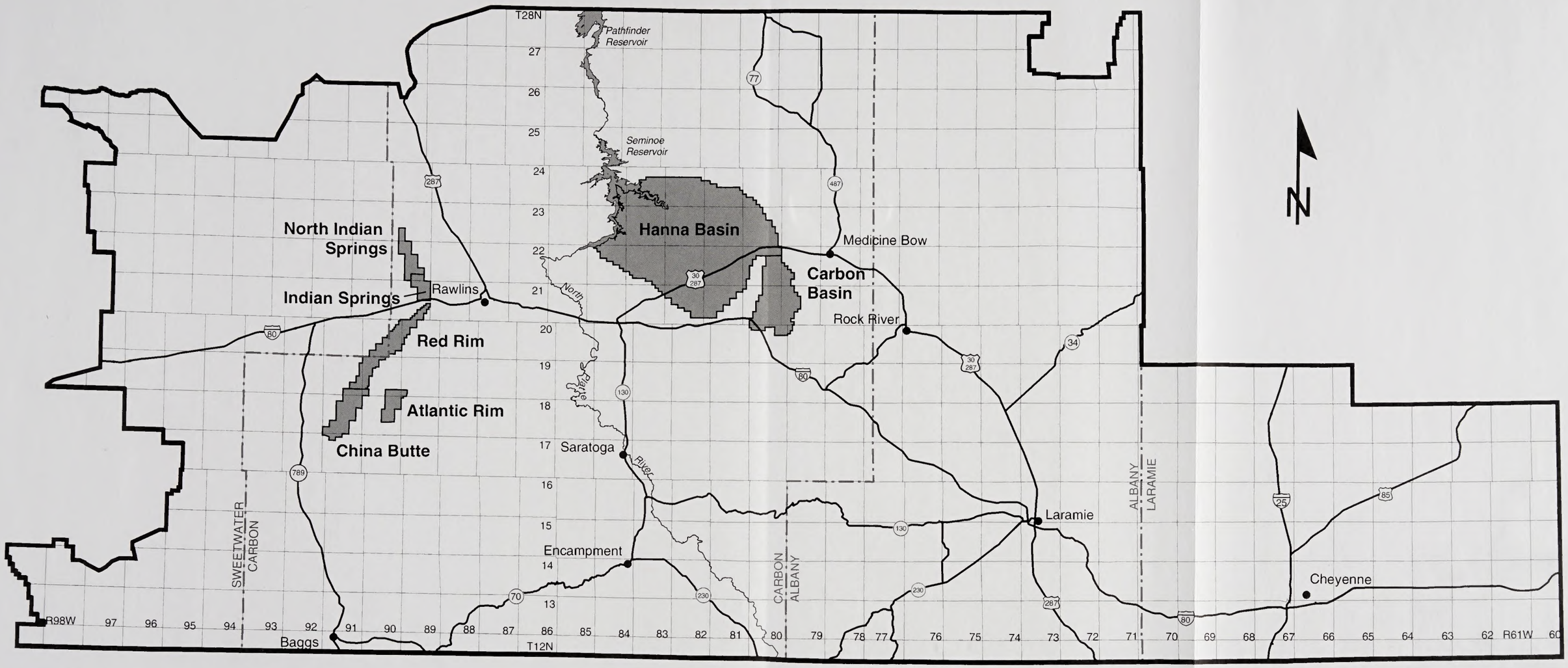
Map 4-6

Pronghorn

Cumulative Impact Analysis Area

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM





Coal Development Potential Areas

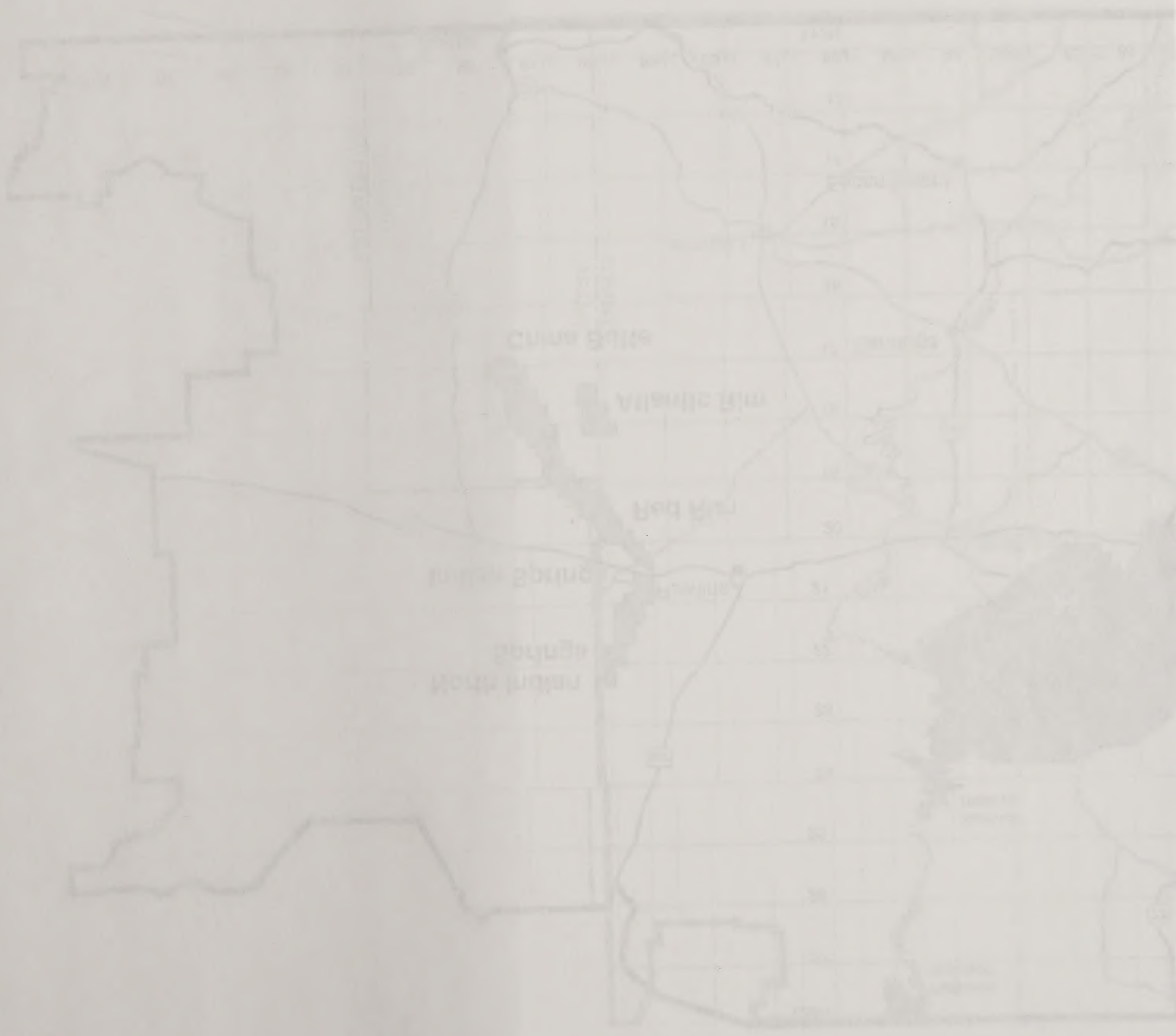
0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map A2-1

Coal Development Potential

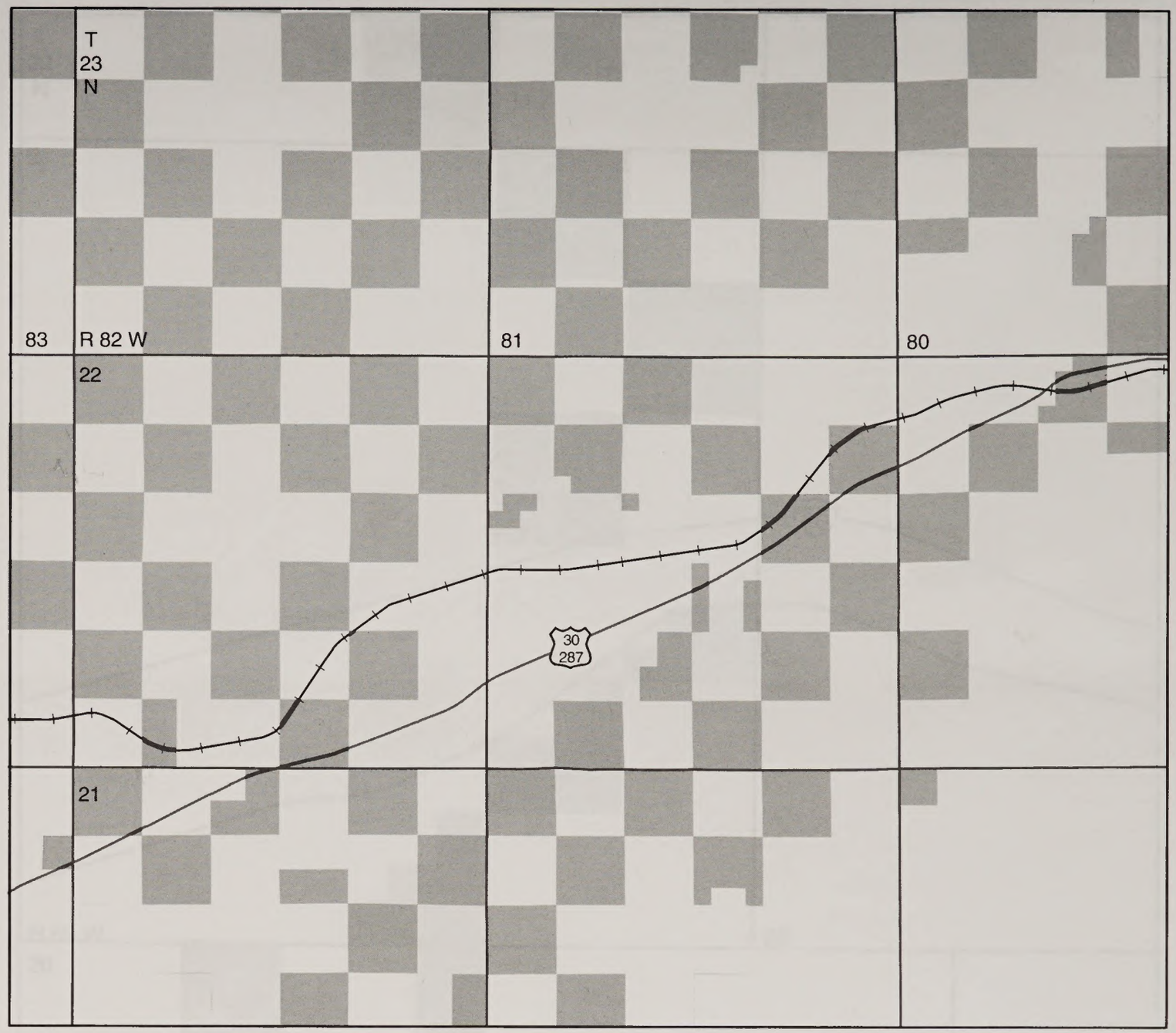
NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM

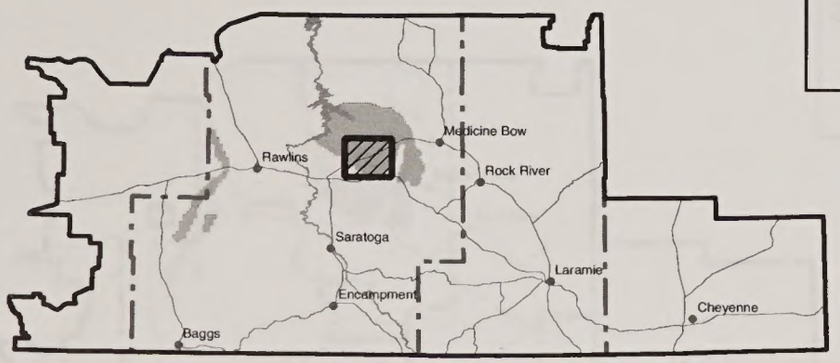


N

Coal Development Potential Areas

Unsuitable Coal Lands





0 1 2 4 6 8 10
Kilometers

0 0.5 1 2 3 4 5
Miles

Map A2-2

Unsuitable Lands within Coal Development Potential

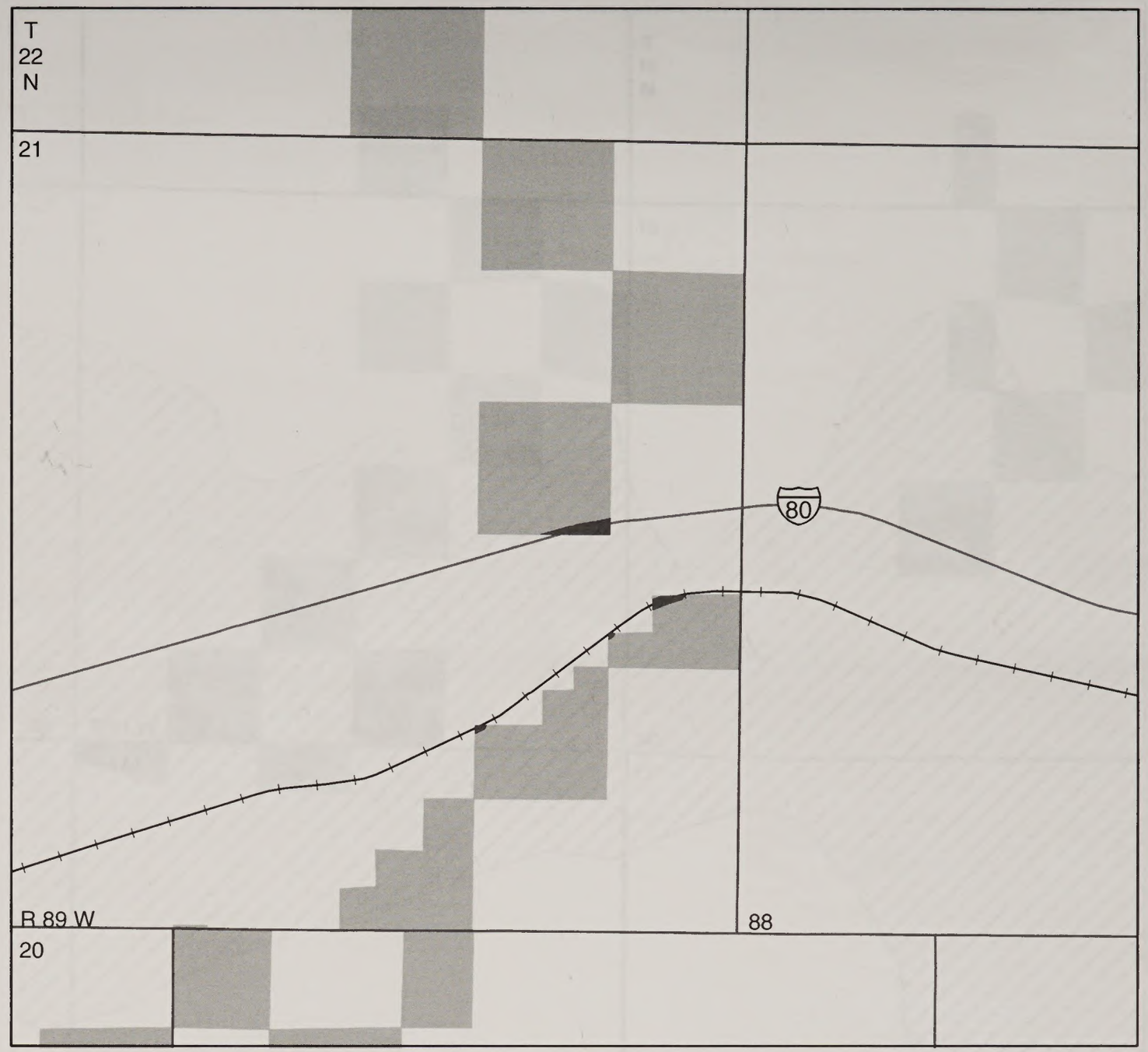
NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM

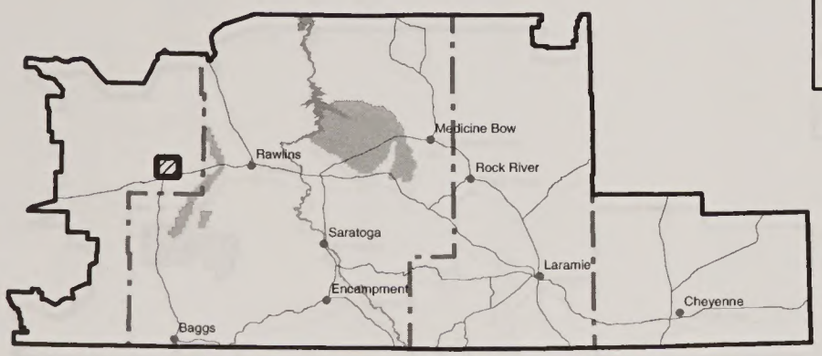


N

Coal Development Potential Areas

Unsuitable Coal Lands





0 0.5 1 2 3 4
Kilometers

0 0.5 1 2
Miles

Map A2-3

Unsuitable Lands within Coal Development Potential

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM

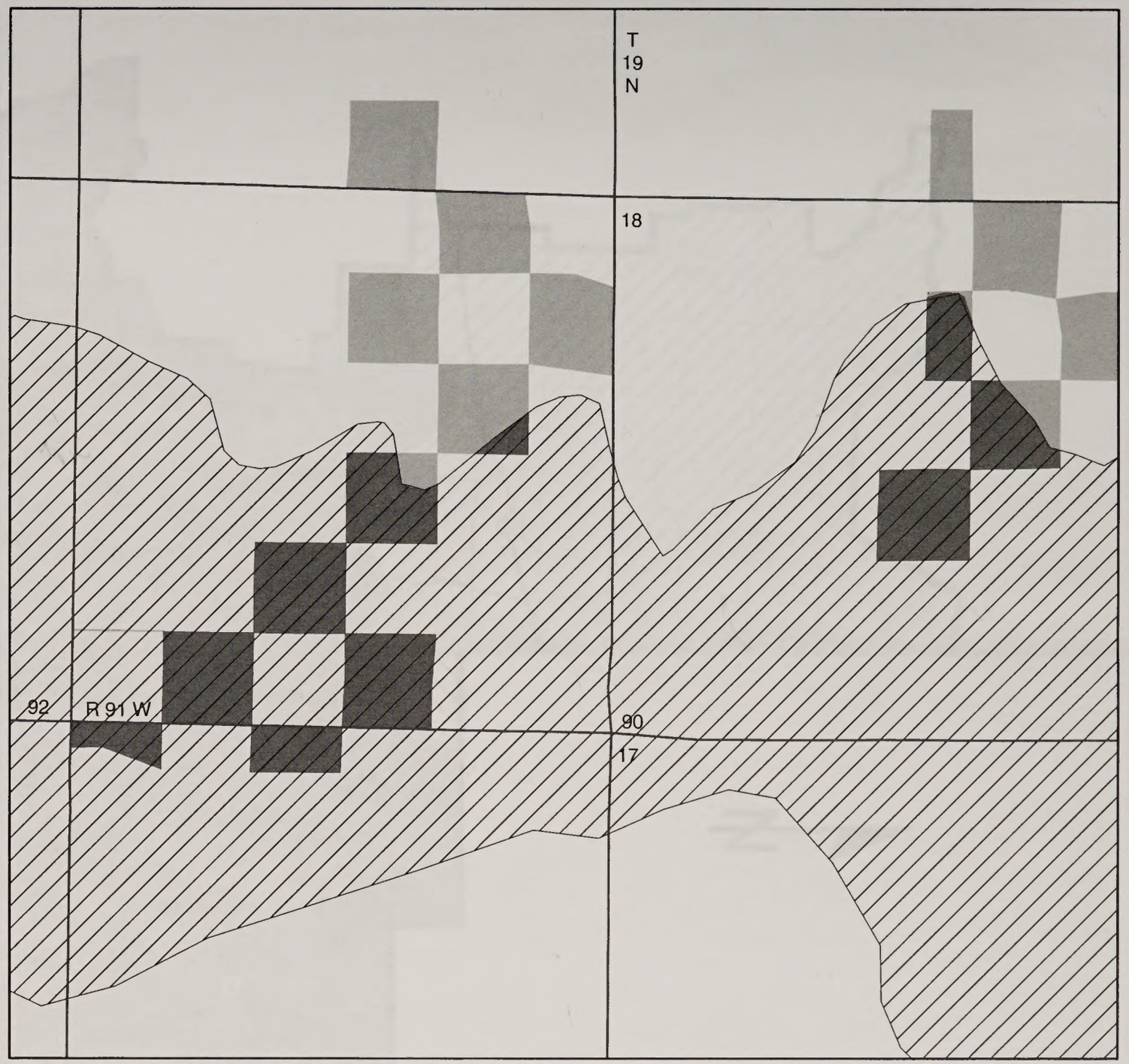


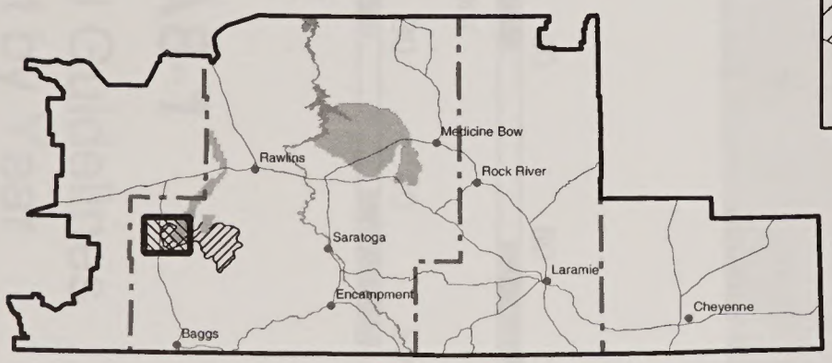
N

Coal Development Potential Areas

Muddy Creek Watershed

Unsuitable Coal Lands





0 1 2 4 6

Kilometers

0 0.5 1 2 3

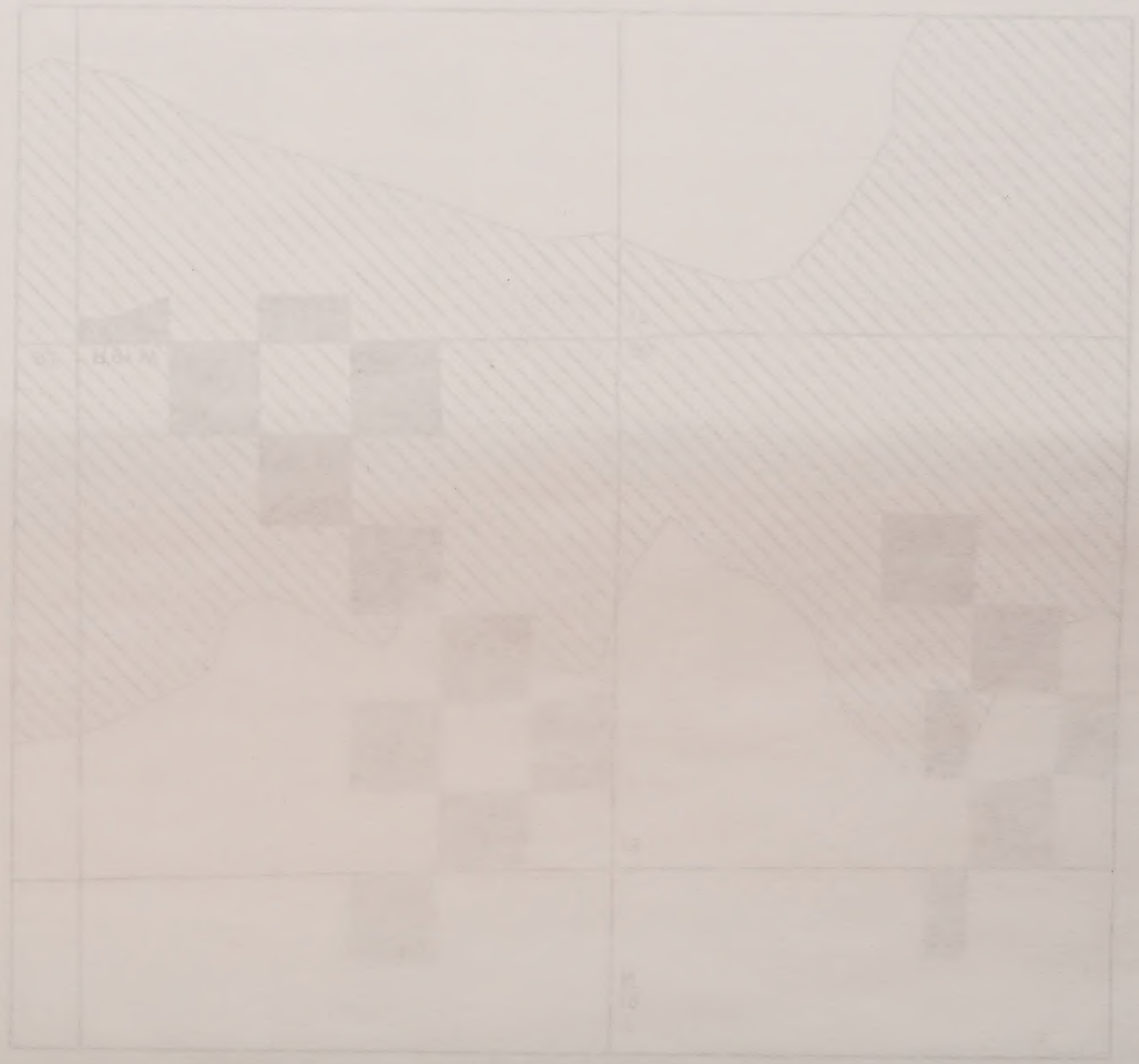
Miles

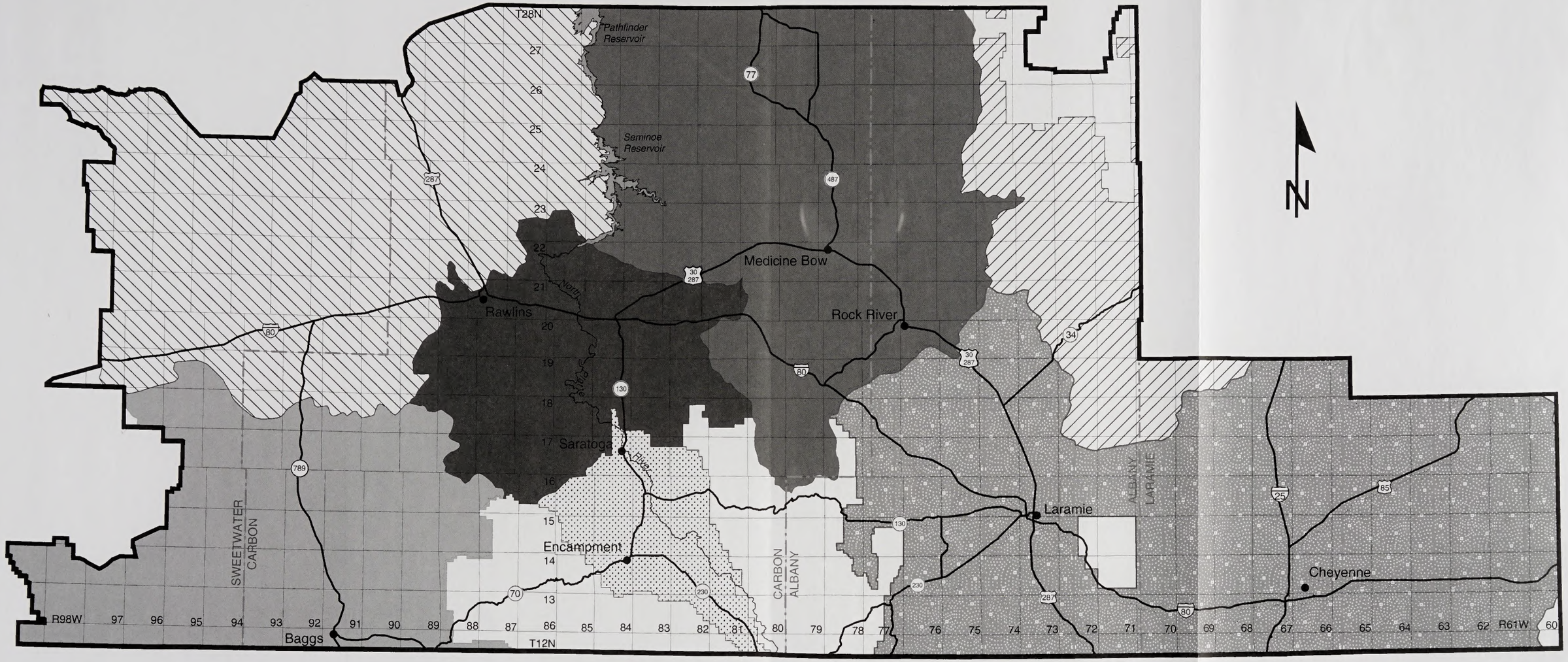
Map A2-4

Unsuitable Lands within Coal Development Potential

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM







2001
2002
2003
2004
2005
2006
2007

0 10 20 40 60 80 100
Kilometers

0 5 10 20 30 40 50
Miles

Map A8-1

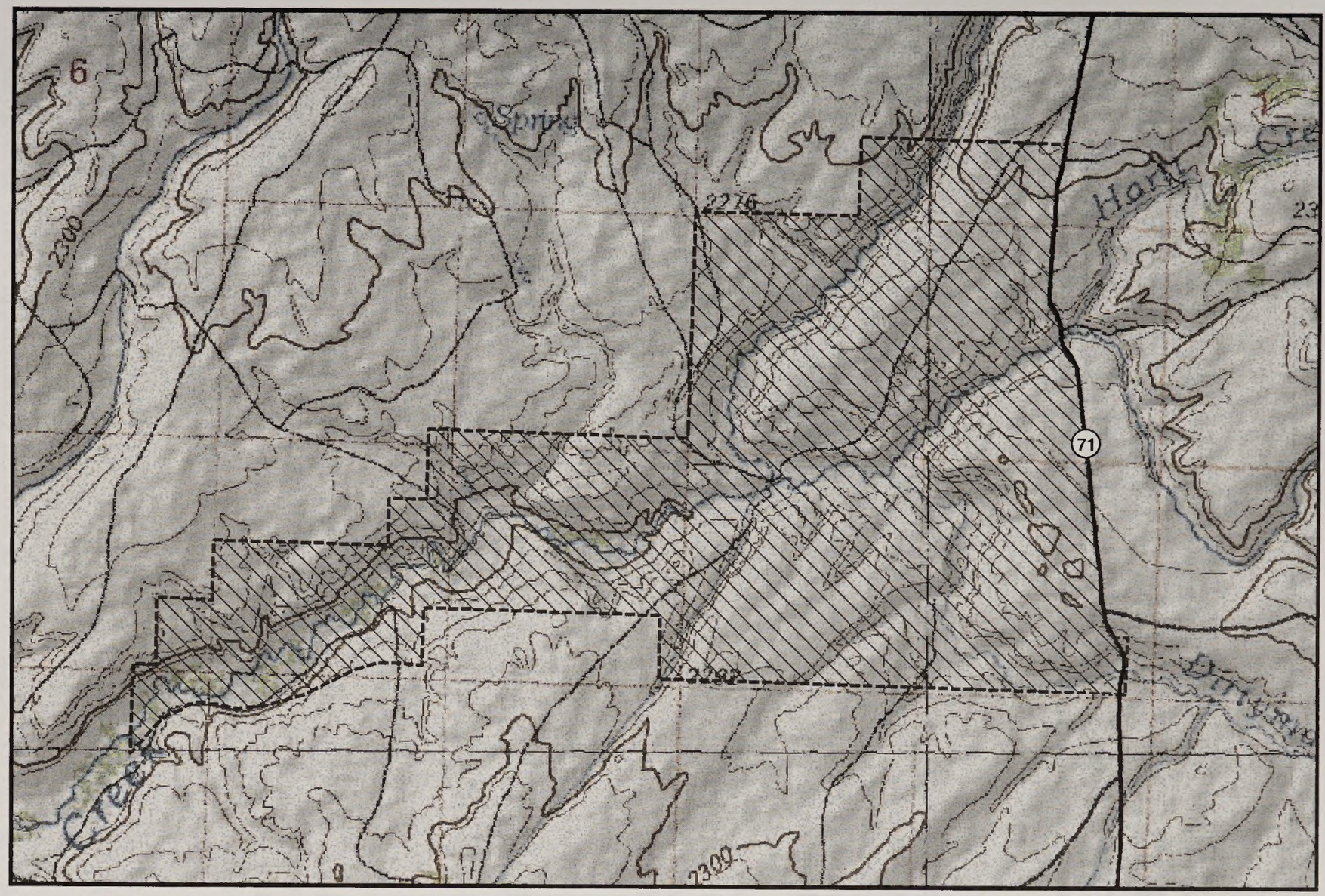
Standards and Guidelines Assessment by Year

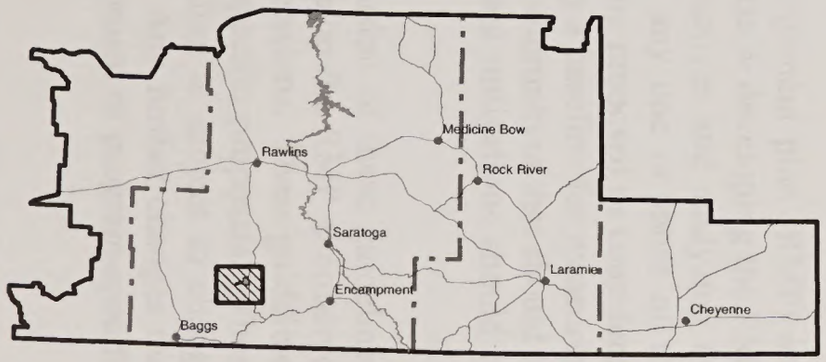
NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM



N

High Savery Dam
MOU Area





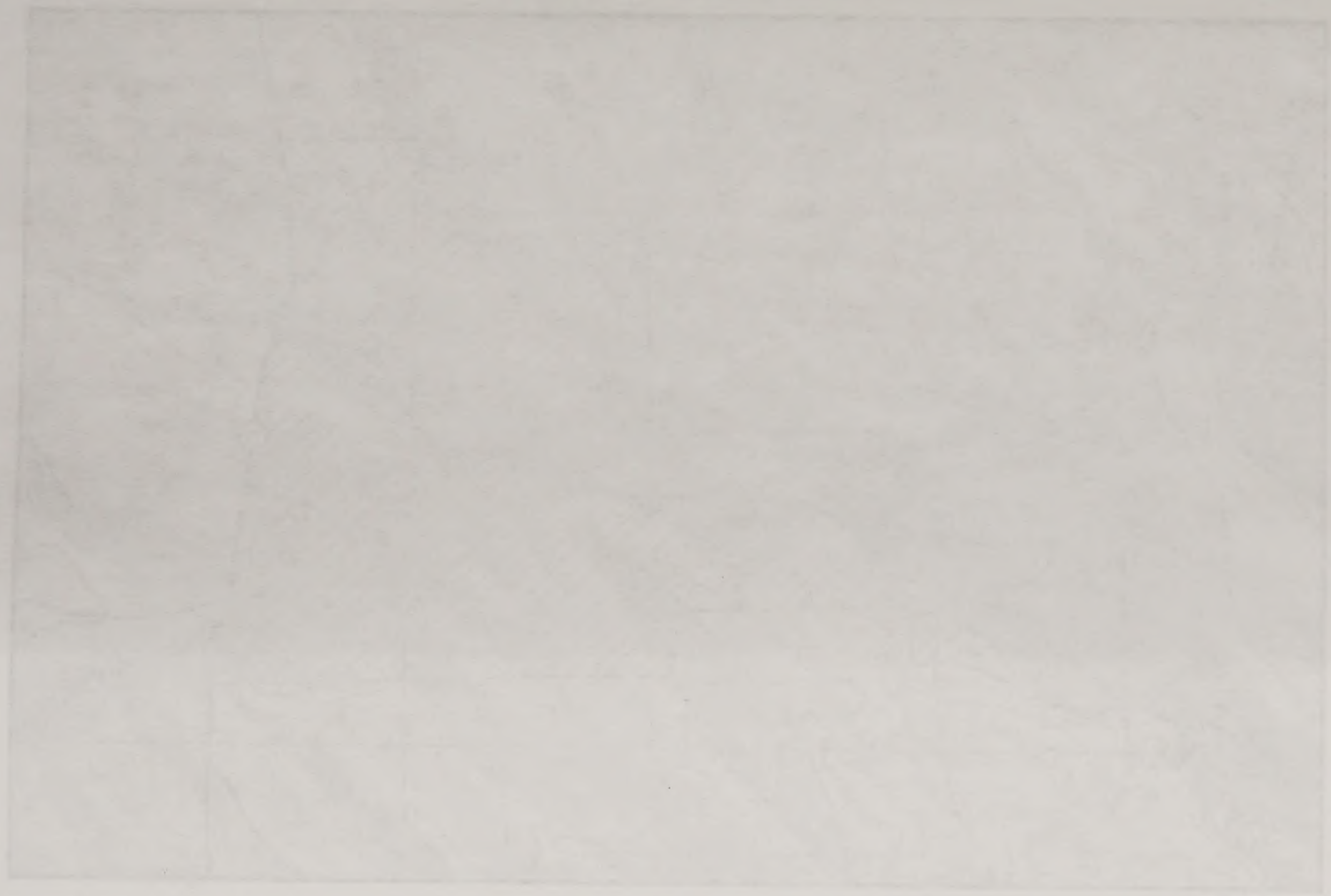
1 0.5 0 1 2 3 4
Kilometers

0.5 0.25 0 0.5 1 1.5 2
Miles

Map A23-1

High Savery Dam MOU

NO WARRANTY IS MADE BY THE BLM FOR USE OF THE DATA FOR PURPOSES NO INTENDED BY BLM



APPENDIX 1—WYOMING BUREAU OF LAND MANAGEMENT (BLM) MITIGATION GUIDELINES FOR SURFACE-DISTURBING AND DISRUPTIVE ACTIVITIES

INTRODUCTION

Wyoming Mitigation Guidelines are a compilation of practices employed by BLM to mitigate impacts from surface disturbance. They apply to activities such as road or pipeline construction, range improvements, and permitted recreation activities. The guidelines are designed to protect resources such as soils and vegetation, wildlife habitat, and cultural or historic properties. The guidelines are presented as an appendix of the Resource Management Plan (RMP) Environmental Impact Statement (EIS) for easy reference as they apply to many resources and derive from many laws. All BLM RMPs have included these guidelines as appendices. Public comment on the guidelines, per se, has not been requested. The guidelines are not land use decisions, rather they are examples of mitigation measures that could be applied, as appropriate, based on site-specific NEPA analysis for individual proposals. Comment on the use and application of specific mitigation measures can be made during the NEPA process for individual proposals. Because mitigation measures change or are modified, based on new information, the guidelines are updated periodically for all Field Offices in Wyoming.

WYOMING BUREAU OF LAND MANAGEMENT (BLM) MITIGATION GUIDELINES FOR SURFACE DISTURBING AND DISRUPTIVE ACTIVITIES

Introduction

These guidelines are primarily for the purpose of attaining statewide consistency in how requirements are determined for avoiding and mitigating environmental impacts and resource and land use conflicts. Consistency in this sense does not mean that identical requirements would be applied for all similar types of land use activities that may cause similar types of impacts. Nor does it mean that the requirements or guidelines for a single land use activity would be identical in all areas.

There are two ways the mitigation guidelines are used in the resource management plan (RMP) and environmental impact statement (EIS) process: (1) as part of the planning criteria in developing the RMP alternatives, and (2) in the analytical processes of both developing the alternatives and analyzing the impacts of the alternatives. In the first case, an assumption is made that any one or more of the mitigations will be appropriately included as conditions of relevant actions being proposed or considered in each alternative. In the second case, the mitigations are used (1) to develop a baseline for measuring and comparing impacts among the alternatives; (2) to identify other actions and alternatives that should be considered, and (3) to help determine whether more stringent or less stringent mitigations should be considered.

The EIS for the RMP does not decide or dictate the exact wording or inclusion of these guidelines. Rather, the guidelines are used in the RMP EIS process as a tool to help develop the RMP alternatives and to provide a baseline for comparative impact analysis in arriving at RMP decisions. These guidelines will be used in the same manner in analyzing activity plans and other site-specific proposals. These guidelines and their wording are matters of policy. As such, specific wording is subject to change primarily through administrative review, not through the RMP EIS process. Any further changes that may be made in the continuing refinement of these guidelines and any development of program-specific

standard stipulations will be handled in another forum, including appropriate public involvement and input.

Purpose

The purposes of the "Wyoming BLM Mitigation Guidelines" are (1) to reserve, for the BLM, the right to modify the operations of all surface and other human presence disturbance activities as part of the statutory requirements for environmental protection, and (2) to inform a potential lessee, permittee, or operator of the requirements that must be met when using BLM-administered public lands. These guidelines have been written in a format that will allow for (1) their direct use as stipulations, and (2) the addition of specific or specialized mitigation following the submission of a detailed plan of development or other project proposal, and an environmental analysis.

Those resource activities or programs currently without a standardized set of permit or operation stipulations can use the mitigation guidelines as stipulations or as conditions of approval, or as a baseline for developing specific stipulations for a given activity or program.

Because use of the mitigation guidelines was integrated into the RMP EIS process and will be integrated into the site-specific environmental analysis process, the application of stipulations or mitigation requirements derived through the guidelines will provide more consistency with planning decisions and plan implementation than has occurred in the past. Application of the mitigation guidelines to all surface and other human presence disturbance activities concerning BLM-administered public lands and resources will provide more uniformity in mitigation than has occurred in the past.

Mitigation Guidelines

1. Surface Disturbance Mitigation Guideline

Surface disturbance will be prohibited in any of the following areas or conditions. Exception, waiver, or modification of this limitation may be approved in writing, including documented supporting analysis, by the Authorized Officer.

a. Slopes in excess of 25 percent.
b. Within important scenic areas (Class I and II Visual Resource Management Areas).
c. Within 500 feet of surface water and/or riparian areas.
d. Within either one-quarter mile or the visual horizon (whichever is closer) of historic trails.
e. Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur.

Guidance

The intent of the SURFACE DISTURBANCE MITIGATION GUIDELINE is to inform interested parties (potential lessees, permittees, or operators) that when one or more of the five (1a through 1e) conditions exist, surface-disturbing activities will be prohibited unless or until a permittee or his designated representative and the surface management agency (SMA) arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development.

Specific criteria (e.g., 500 feet from water) have been established based upon the best information available. However, such items as geographical areas and seasons must be delineated at the field level.

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

2. Wildlife Mitigation Guideline

a. To protect important big game winter habitat, activities or surface use will not be allowed from November 15 to April 30 within certain areas encompassed by the authorization. The same criteria apply to defined big game birthing areas from May 1 to June 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

b. To protect important raptor and/or sage and sharp-tailed grouse nesting habitat, activities or surface use will not be allowed from February 1 to July 31 within certain areas encompassed by the authorization. The same criteria apply to defined raptor and game bird winter concentration areas from November 15 to April 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

c. No activities or surface use will be allowed on that portion of the authorization area identified within (legal description) for the purpose of protecting (e.g., sage/sharp-tailed grouse breeding grounds, and/or other species/activities) habitat.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

d. Portions of the authorized use area legally described as (legal description), are known or suspected to be essential habitat for (name) which is a threatened or endangered species. Prior to conducting any onsite activities, the lessee/permittee will be required to conduct inventories or studies in accordance with BLM and U.S. Fish and Wildlife Service guidelines to verify the presence or absence of this species. In the event that (name) occurrence is identified, the lessee/permittee will be required to modify operational plans to include the protection requirements of this species and its habitat (e.g., seasonal use restrictions, occupancy limitations, facility design modifications).

Guidance

The WILDLIFE MITIGATION GUIDELINE is intended to provide two basic types of protection: seasonal restriction (2a and 2b) and prohibition of activities or surface use (2c). Item 2d is specific to situations involving threatened or endangered species. Legal descriptions will ultimately be required and should be measurable and legally definable. There are no minimum subdivision requirements at this time. The area delineated can and should be defined as necessary, based upon current biological data, prior to

the time of processing an application and issuing the use authorization. The legal description must eventually become a part of the condition for approval of the permit, plan of development, and/or other use authorization.

The seasonal restriction section identifies three example groups of species and delineates three similar time frame restrictions. The big game species including elk, moose, deer, antelope, and bighorn sheep, all require protection of crucial winter range between November 15 and April 30. Elk and bighorn sheep also require protection from disturbance from May 1 to June 30, when they typically occupy distinct calving and lambing areas. Raptors include eagles, accipiters, falcons (peregrine, prairie, and merlin), buteos (ferruginous and Swainson's hawks), osprey, and burrowing owls. The raptors and sage and sharp-tailed grouse require nesting protection between February 1 and July 31. The same birds often require protection from disturbance from November 15 through April 30 while they occupy winter concentration areas.

Item 2c, the prohibition of activity or surface use, is intended for protection of specific wildlife habitat areas or values within the use area that cannot be protected by using seasonal restrictions. These areas or values must be factors that limit life-cycle activities (e.g., sage-grouse strutting grounds, known threatened and endangered species habitat).

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

3. Cultural Resource Mitigation Guideline

When a proposed discretionary land use has potential for affecting the characteristics which qualify a cultural property for the National Register of Historic Places (National Register), mitigation will be considered. In accordance with Section 106 of the Historic Preservation Act, procedures specified in 36 CFR 800 will be used in consultation with the Wyoming State Historic Preservation Officer and the Advisory Council on Historic Preservation in arriving at determinations regarding the need and type of mitigation to be required.

Guidance

The preferred strategy for treating potential adverse effects on cultural properties is "avoidance." If avoidance involves project relocation, the new project area may also require cultural resource inventory. If avoidance is imprudent or unfeasible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative measures.

Reports documenting results of cultural resource inventory, evaluation, and the establishment of mitigation alternatives (if necessary) shall be written according to standards contained in BLM Manuals, the cultural resource permit stipulations, and in other policy issued by the BLM. These reports must provide sufficient information for Section 106 consultation. Reports shall be reviewed for adequacy by the appropriate BLM cultural resource specialist. If cultural properties on, or eligible for, the National Register are located within these areas of potential impact and cannot be avoided, the Authorized Officer shall begin the Section 106 consultation process in accordance with the procedures contained in 36 CFR 800.

Mitigation measures shall be implemented according to the mitigation plan approved by the BLM Authorized Officer. Such plans are usually prepared by the land use applicant according to BLM

specifications. Mitigation plans will be reviewed as part of Section 106 consultation for National Register eligible or listed properties. The extent and nature of recommended mitigation shall be commensurate with the significance of the cultural resource involved and the anticipated extent of damage. Reasonable costs for mitigation will be borne by the land use applicant. Mitigation must be cost effective and realistic. It must consider project requirements and limitations, input from concerned parties, and be BLM approved or BLM formulated.

Mitigation of paleontological and natural history sites will be treated on a case-by-case basis. Factors such as site significance, economics, safety, and project urgency must be taken into account when making a decision to mitigate. Authority to protect (through mitigation) such values is provided for in FLPMA, Section 102(a)(8). When avoidance is not possible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative protection measures.

4. Special Resource Mitigation Guideline

- To protect (resource value), activities or surface use will not be allowed (i.e., within a specific distance of the resource value or between date to date) in (legal description).
- Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.
- Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.
- Example Resource Categories (Select or identify category and specific resource value):
  - Recreation areas.
  - Special natural history or paleontological features.
  - Special management areas.
  - Sections of major rivers.
  - Prior existing rights-of-way.
  - Occupied dwellings.
  - Other (specify).

Guidance

The SPECIAL RESOURCE MITIGATION GUIDELINE is intended for use only in site-specific situations where one of the first three general mitigation guidelines will not adequately address the concern. The resource value, location, and specific restrictions must be clearly identified. A detailed plan addressing specific mitigation and special restrictions will be required prior to disturbance or development and will become a condition for approval of the permit, plan of development, or other use authorization.

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

5. No Surface Occupancy Guideline

- No Surface Occupancy will be allowed on the following described lands (legal description) because of (resource value).
- Example Resource Categories (Select or identify category and specific resource value):
- Recreation Areas (e.g., campgrounds, historic trails, national monuments).
- Major reservoirs/dams.
- Special management area (e.g., known threatened or endangered species habitat, areas suitable for consideration for wild and scenic rivers designation).
- Other (specify).

Guidance

The NO SURFACE OCCUPANCY (NSO) MITIGATION GUIDELINE is intended for use only when other mitigation is determined insufficient to adequately protect the public interest and is the only alternative to "no development" or "no leasing." The legal description and resource value of concern must be identified and be tied to an NSO land use planning decision.

Waiver of, or exception(s) to, the NSO requirement will be subject to the same test used to initially justify its imposition. If, upon evaluation of a site-specific proposal, it is found that less restrictive mitigation would adequately protect the public interest or value of concern, then a waiver or exception to the NSO requirement is possible. The record must show that because conditions or uses have changed, less restrictive requirements will protect the public interest. An environmental analysis must be conducted and documented (e.g., environmental assessment, environmental impact statement, etc., as necessary) in order to provide the basis for a waiver or exception to an NSO planning decision. Modification of the NSO requirement will pertain only to refinement or correction of the location(s) to which it applied. If the waiver, exception, or modification is found to be consistent with the intent of the planning decision, it may be granted. If found inconsistent with the intent of the planning decision, a plan amendment would be required before the waiver, exception, or modification could be granted.

When considering the "no development" or "no leasing" option, a rigorous test must be met and fully documented in the record. This test must be based upon stringent standards described in the land use planning document. Since rejection of all development rights is more severe than the most restrictive mitigation requirement, the record must show that consideration was given to development subject to reasonable mitigation, including "no surface occupancy." The record must also show that other mitigation was determined to be insufficient to adequately protect the public interest. A "no development" or "no leasing" decision should not be made solely because it appears that conventional methods of development would be unfeasible, especially where an NSO restriction may be acceptable to a potential permittee. In such cases, the potential permittee should have the opportunity to decide whether or not to go ahead with the proposal (or accept the use authorization), recognizing that an NSO restriction is involved.

APPENDIX 2—2003 COAL SCREENING PROCESS SUMMARY

INTRODUCTION

The Federal Coal Leasing Amendments Act of 1976 requires federal coal lands considered for leasing to be identified in a comprehensive land use plan. Most, but not all, of the federal coal lands within the current Rawlins Resource Management Plan Planning Area (RMPPA) were last evaluated in 1990 (BLM, 1990). However, only unleased lands were evaluated; in accordance with regulations found under 43 CFR 3461, unsuitability criteria cannot be applied to leased lands. Consequently, lands held by the coal leases in 1990 were exempt from evaluation under the coal screening process. Further, some of those previously leased federal coal lands are no longer under lease, and therefore, are eligible for evaluation at this time.

To implement competitive coal leasing under regulations contained in 43 CFR 3420, the Bureau of Land Management (BLM) established (on November 9, 1979) a number of federal coal production "Regions," including the Green River–Hams Fork Region, the federal coal region in which the RMPPA is located. The region was then decertified by the Green River-Hams Fork Regional Coal Team to allow the "lease-by-application" (LBA) process for coal leasing within the region. A decision document and request for public comment were published in the *Federal Register* (December 28, 1987). Only two comments were received, both supportive of an LBA process within the region. Because of the limited industry interest in additional tracts of federal coal in the region, it was determined that leasing in the region would henceforth be administered under the LBA process in accordance with 43 CFR 3425.

Since the federal coal lands within the RMPPA were last reviewed and evaluated in 1990, there have been changes in the lease status within the Carbon Basin coal area. At that time, the 1990 Great Divide Resource Area RMP was prepared, approximately 60 percent of the federal coal lands within the Carbon Basin coal area were not included in the 1990 coal screening and planning process. The remaining portions of federal coal lands were not included in the coal screening process because of the lack of interest expressed in leasing the federal coal lands in this area. Development of the leased coal was never pursued, and the subject lease (Original Carbon Basin lease) expired in 1992.

Subsequent to the 1992 lease expiration, Ark Land Company of St. Louis, Missouri (an affiliate of Arch of Wyoming, Inc., operator of the Medicine Bow and Seminoe II mines) filed an LBA with the BLM (pursuant to 43 CFR 3425.1) on federal coal lands within the Carbon Basin coal area. Upon filing of the LBA, BLM conducted an Environmental Assessment (EA) for the coal planning decisions in the Carbon Basin Coal Area; the subsequent Decision Record found that 12,118 unleased acres in Carbon Basin were acceptable for further consideration for coal leasing. Following completion of the EA, BLM prepared the Carbon Basin Coal Project Environmental Impact Statement (CBCPEIS) and the subsequent Record of Decision that was completed in March 1998. As a result of these investigations and findings, the Ark Land Company obtained federal coal lease WYW 139975 (December 1, 1999), comprising 5,235.15 acres of federal coal within the Carbon Basin coal area (covering both surface and underground mining). This lease is effective for 20 years, and thereafter as long as the condition of continued operation is met. The continued operation stipulation requires the operator to produce 1 percent of the recoverable coal reserves existing on the lease by December 1, 2009, or the lease will be terminated at that time by operation of law. This approval corresponds with the requirements for leasing of land as stated in the Final EIS (Chapter 2).

In addition to federal coal lease WYW 139975, the Ark Land Company holds other federal coal leases associated with Arch of Wyoming, Inc.'s Medicine Bow and Seminoe II mines, both of which are located near Hanna. These two mines are currently in the final stages of production, with termination of mining operations anticipated to occur within 5 years. Reclamation of both mines is anticipated to continue until 2008.

With the termination of mining operations at the Medicine Bow and Seminoe II mines, and in the absence of development of the Carbon Basin coal area, there will soon be no active mining or ongoing development of federal coal within the RMPPA. Current indications are that there will be no additional coal leasing activity or development for the duration of the 20-year planning period. However, as part of the existing EIS cumulative impact analysis, development of coal mines would be analyzed at levels identified in the CBCPEIS.

The objectives in managing the federal coal resource in the planning area are: (i) to provide for both short- and long-range development of federal coal in an orderly and timely manner, consistent with the federal coal management program, policies, environmental integrity, national energy needs, and related demands; (ii) to identify federal coal that is acceptable for further consideration for leasing; and (iii) to identify appropriate mitigation for sensitive areas.

However, at present, BLM will only complete the coal screening process through Step 2 (Application of Coal Unsuitability Criteria). This means that BLM will identify lands with coal development potential as "acceptable" or "unsuitable," but will not proceed to complete the multiple use conflicts analysis or surface owner consultation steps of the screening process until receiving an LBA (43 CFR 3420.1-4 (e) (3) and (4)). If an LBA is filed with BLM, then BLM will perform the remaining two steps of the coal screening process and amend the land use plan to incorporate the decisions for the portions of land that are considered acceptable for leasing.

CONSULTATION AND COORDINATION

On February 25, 2003, BLM published a Notice of Intent to revise the Great Divide Resource Management Plan and called for coal and other resource information. The data call requested coal resource data and/or other information relative to determining interest in potential coal development within the RMPPA. No comments were received as a result of this data call. In particular, no comments or statements of interest were received from the coal industry (potential lessees).

During March 2003, BLM conducted a series of scoping meetings to encourage participation in the RMP planning process and, again, to seek resource data and other information useful to the planning process within the RMPPA.

Comments were received from the U.S. Fish and Wildlife Service (USFWS) and Wyoming Game and Fish Department (WGFD) as required under the consultation requirement of the coal unsuitability criteria found at 43 CFR 3461.

AREA DESCRIPTION

All areas underlain by coal resources in the RMPPA were reviewed for coal leasing and development potential. The areas with greatest potential were in the Hanna coal field, which lies in the eastern portion of the Green River-Hams Fork coal region, and the Green River Basin, lying in the central portion of this region as shown on Map A2-1 (BLM 1990 and 2003, Glass and Roberts, 1979). The indicated area(s) comprise a total of 7 individual federal coal development potential areas (CDPAs) underlain by an

estimated 2,630,800,000 tons of federal coal. This coal contains an average of 10,420 British Thermal Units of energy per pound (BTU/lb.) and has an average sulfur content of 0.63 percent.

Only the areas containing federally owned coal within the identified coal development potential areas were reviewed and evaluated. Any consideration for possible development of federally owned coal outside of these categories will be reviewed as future demand and need is indicated. Existing federal coal leases, as previously discussed, are not appropriate for review; however, existing federal coal leases were taken into account in the reasonably foreseeable coal development scenarios and in the impact analyses conducted for the Rawlins RMP EIS.

Current active coal leases in the RMPPA are owned by Arch of Wyoming, Inc. These leases are comprised of the Medicine Bow mine (leases WYW-82736, WYW-72989, and WYW-58095) and the Seminoe II mine (leases WYC-033800, WYW-045728, and WYW-049338). No coal is being mined from these leases. Sales are from stockpiled coal resources, and the only current activity on the leases consists of reclamation. No new coal mining activity is projected from these leases.

Presumably, Arch of Wyoming, Inc., would develop the Carbon Basin Coal Project in conjunction with the conclusion of operations at its Medicine Bow and Seminoe II mines. While Ark Land Company holds a valid, existing lease within the Carbon Basin area of the RMPPA, the possibility remains that under current and anticipated market conditions, the lessee may not actively pursue development of the lease within the projected 20-year planning period. This, in combination with the apparently limited mine life remaining at the Medicine Bow and Seminoe II mines and the indicated general lack of other industry interest in further coal leasing within the RMPPA, suggests that the coal development potential within the RMPPA is marginal, at best, over the applicable 20-year planning period.

COAL SCREENING/PLANNING PROCEDURES

The Federal Coal Management Program established four major steps to identify areas of federal coal that are acceptable for further leasing consideration under the process listed in 43 CFR 3420.1-4(e)(1-4). The four steps are (1) identification of areas with coal development potential; (2) application of the unsuitability criteria; (3) evaluation of other multiple use conflicts; and (4) surface owner consultation.

Application of the latter three coal screening steps (as further described below) results in (a) identifying areas that are acceptable for further leasing consideration in each of these three steps; and (b) identifying areas that are unsuitable (Step 2), unacceptable (Step 3), or unavailable (Step 4) for further leasing consideration. Those federal coal areas that pass through the screening process are determined to be acceptable for further consideration for leasing. Collectively, these steps are called the "Coal Screening Process" (43 CFR 3420.1-4 (e) (1-4)) and are applied to the federal coal review area(s).

The following is a description of the steps of the coal screening process and how they were applied to the federal CDPAs. Please note, however, that for the Carbon Basin Coal Project, the screening process was completed only through the second step for this RMP. Multiple-use conflicts analysis and surface owner consultation steps were deferred until an LBA is filed or industry begins expressing an interest in developing coal resources in the planning area.

Step 1—Identification of Coal Development Potential

All areas of known and assumed federal coal with development potential for both surface and subsurface mining are identified using geological and economic data.

Step 2—Application of Coal Unsuitability Criteria

As required by 43 CFR 3461, the 20 coal unsuitability criteria are applied to all known and assumed federal CDPAs. The 1976 Federal Coal Leasing Amendments Act and the 1977 Surface Mining Control and Reclamation Act (SMCRA) are the legal authorities for applying the unsuitability criteria.

These criteria involve consideration of existing resource values such as scenic areas, natural and historic values, wildlife, floodplains, alluvial valley floors, etc. The purpose of this step is to identify areas with key features of environmental sensitivity that would make them unsuitable for surface coal mining, or for underground coal mining where the surface is impacted.

Step 3—Multiple-Use Conflict Evaluation

This step is a review of those federal coal lands that remain acceptable after applying the coal unsuitability criteria. It involves consideration of other multiple-use values (i.e., not directly concerned with the unsuitability criteria) and identifying any areas that would be unacceptable (in addition to those identified as unsuitable) for surface or subsurface coal mining or for surface operations and impacts associated with coal mining. The multiple land use decisions (43 CFR 3420.1-4(e)(3)) place particular emphasis on protecting air and water quality; wetlands, riparian areas, and sole-source aquifers; and the federal lands, which, if leased, would adversely impact units of the National Park System, the National Wildlife Refuge System, the National System of Trails, and the National Wild and Scenic Rivers System.

Step 4—Surface Owner Consultation

Section 714 (d) of the Surface Mining Control and Reclamation Act (SMCRA) and 43 CFR 3420.1-4(e)(4) require BLM to consult with qualified owners of split estate lands (i.e., private surface ownership over federally owned coal) when surface mining of the federal coal is being considered. This step does not apply to areas where only subsurface mining methods are concerned.

In this consultation process, qualified surface owners are asked to express their preference for or against surface mining of the federal coal under their private lands. An individual surface owner or significant numbers of these surface owners expressing a preference against surface mining could result in identifying some of these split estate lands as unacceptable for leasing and development of the federal coal. In such cases, these areas can still be considered for possible leasing beyond this land use planning stage. This is possible because the actual commitment of surface owner consent or refusal to consent does not occur until later in the coal inventory planning process, or in final processing of an individual coal lease application, prior to offering a lease for the federal coal involved.

How the Procedures Are Applied

To help clarify the coal screening process conducted in the planning area, three categories of coal and land/mineral ownership relationships are identified: (1) federal coal lease areas; (2) areas where federally owned land surface overlies federally owned coal; and (3) areas where private and state owned land surface overlies federally owned coal. The federal coal areas are those areas containing coal with development potential to be considered for new federal coal leasing for either surface or subsurface mining methods, modifications to existing leases, emergency leasing, and exchanges.

The following procedures are in accordance with the Mineral Leasing Act of 1920, the Federal Coal Leasing Amendments Act of 1976, the Federal Land Policy and Management Act of 1977, the Federal

Coal Management Program adopted by the Secretary of the Interior in June 1979 (and modified by a secretarial decision issued in January 1986), and all related federal regulations.

Findings

The following is a summary of the findings and related recommendations resulting from conducting the coal screening process. All indicated acreages and tonnages are approximate. Additional documentation and background information (including step one of the process documentations, maps of coal areas, and areas of coal with development potential) explaining in detail how the procedures were used and the findings derived are available for public review at the BLM Rawlins District office.

Step 1—Identification of Coal Development Potential

Areas of federal coal (see Map A2-1) with development potential for both surface and subsurface mining were identified using geological and economic data submitted by coal companies, published sources, and interpretations of available geological data from other sources.

Table A2-1: RMPPA Development Potential Coal, lists the approximate federal acreage and coal tonnage, number of mineable seams, and average coal quality characteristics (on a Proximate Analysis basis) for each of the CDPAs.

Table A2-1. RMPPA Development Potential Coal

Name of CDPA	Fed. Acres	Fed. Coal (thousand of tons)	Mineable Seams	Average Proximate Analysis			
				BTU/lb.	% Moisture	% Ash	% Sulfur
Atlantic Rim	3,840	91,000	4	10,471	13.56	5.15	0.92
Carbon Basin	12,120	210,000	2	11,302	10.85	10.94	0.59
China Butte	6,240	125,000	4	8,438	25.01	7.18	0.39
Hanna Basin	30,040	2,081,000	9	10,487	11.47	9.44	0.65
Indian Springs	2,560	35,800	3	9,626	14.75	8.24	0.33
North Indian Springs	3,840	25,000	3	9,015	17.14	7.69	0.46
Red Rim	9,720	31,000	5	8,931	20.97	7.58	0.33
Total:	**68,360**	**2,598,800**	–	**10,420**	**12.34**	**9.27**	**0.63**

Note: Coal quality and quantity data (mineable seams) for the Carbon Basin, Hanna Basin, Indian Springs, and North Indian Springs CDPAs are representative of depths ranging from the surface to 3,000 feet below ground surface. Data for the Atlantic Rim, China Butte, and Red Rim CDPAs are for surface-mineable depth coal only.

Step 2—Application of Coal Unsuitability Criteria

Introduction

As required by 43 CFR 3461, the 20 coal unsuitability criteria were applied to all areas identified as having coal development potential in Step 1 of the coal screening process. These criteria involve consideration of existing resource values such as scenic areas, natural and historic values, wildlife, floodplains, alluvial valley floors, etc. The purpose of this step is to identify areas with key features of environmental sensitivity that would make them unsuitable or require exceptions or exemptions to a criterion for surface coal mining or for surface impacts associated with coal mining. In addition, consultation with federal and state agencies such as the USFWS and/or the state wildlife agency is

required in the determination of coal unsuitability. For this project, the USFWS and the WGFD were contacted at the appropriate points in the evaluation process.

Findings

Application of the coal unsuitability criteria resulted in a determination that approximately 5,020 acres (containing an estimated 70.1 million tons of surface mineable federal coal) were unsuitable for surface coal mining. This reflects the six of the seven identified CDPAs; the North Indian Springs CDPA had no unsuitable areas. Table A2-2, RMPPA Unsuitable Coal Areas and Affected Tonnage, provides a summary (by category) of the approximate acreages and estimated affected coal tonnage as determined by the coal unsuitability analysis. In addition, unsuitable coal areas are depicted on Maps A2-2, A2-3, and A2-4.

Table A2-2. RMPPA Unsuitable Coal Areas and Affected Tonnage

Unsuitable Criterion:	Acres	Tons
#2—Rights of Way (ROWs) and Easements	470	299,000
#15—Habitat for State High-Interest Wildlife and Plants	4,520	69,770,000
#16—Riverine, Coastal, and Special Floodplains	30	0
Total:	**5,020**	**70,069,000**

It should be noted that the Carbon Basin floodplain development potential and unsuitability determination are going through a reevaluation process. The detailed screening process performed in 1998 for the Carbon Basin will be carried forward in support of the coal actions identified for the Carbon Basin in the alternatives evaluation section of Chapter 2 of the EIS.

Some specific requirements are not known before the application is filed, and therefore BLM may deem additional assessment necessary. These requirements include some associated with criterion 9 (mitigation requirements as part of exception to the criterion), which discusses critical habitat for listed threatened or endangered plant and animal species, and with criteria 11–15 (bald or golden eagles [nest or buffer zone around the nesting areas, roost and concentration areas], falcon cliff nesting sites and buffer zone areas of the nest, migratory bird species, habitat for resident species of fish, and wildlife and plants of high interest to the state and that are essential to preserve the habitat). In addition, specific requirements for criterion 16 (unsuitability of floodplain areas and alluvial valley floors for mining because of the potential loss of life or property) and criterion 19 (interruption to farming activities) may require additional assessments. These requirements are part of mitigation measures, which are exceptions to the criterion.

Findings are presented in the individual CDPA Status Summaries Section. In addition, detailed discussion of the individual unsuitability criteria analyses is provided below. Note: The application of the Coal Unsuitability criterion will be reevaluated and updated once a lease application is received.

Individual CDPA Status Summaries

- **Atlantic Rim:** No unsuitable lands were identified within the Atlantic Rim CDPA for criteria 1–14 and 16–20. Approximately 1,390 acres (19,578,000 tons) were determined to be unsuitable for coal mining and surface disturbance associated with coal mining under criterion 15, Habitat for State High-Interest Wildlife and Plants, as associated with the Muddy Creek watershed and the presence of BLM sensitive fishes. In addition, further evaluation and/or mitigation requirements are or may be associated with criteria 9, 11–16, and 19, as discussed above.

- **Carbon Basin:** No "unsuitable" lands were identified within the Carbon Basin CDPA for criteria numbers 1–15 and 17–20. Approximately 30 acres (no affected mineable coal tonnage) were determined to be "unsuitable" for coal mining and surface disturbance associated with coal mining under criterion 16, Riverine, Coastal, and Special Floodplains, as associated with floodplain areas of the Medicine Bow River. In addition, further evaluation and/or mitigation requirements are or may be associated with criteria 9, 11–16, and 19.

- **China Butte:** No unsuitable lands were identified within the China Butte CDPA for criteria 1–14 and 16–20. Approximately 3,130 acres (50,192,000 tons) were determined to be unsuitable for coal mining and surface disturbance associated with coal mining under criterion 15, Habitat for State High-Interest Wildlife and Plants, as associated with the Muddy Creek watershed and the presence of BLM sensitive fishes. In addition, further evaluation and/or mitigation requirements are or may be associated with criteria 9, 11–16, and 19 as discussed above.

- **Hanna Basin:** No unsuitable lands were identified within the Hanna Basin CDPA for criteria 1 and 3–20. Approximately 440 acres (107,000 tons) were determined to be unsuitable for coal mining and surface disturbance associated with coal mining under criterion 2, Rights-of-Way (ROWs) and Easements, as associated with Highway 30/287 and Union Pacific Railroad (U.P.R.R.) ROWs. In addition, further evaluation and/or mitigation requirements are or may be associated with criteria 9, 11–16, and 19, as discussed above.

- **Indian Springs:** No unsuitable lands were identified within the Indian Springs CDPA for criteria 1 and 3–20. Approximately 20 acres (no affected mineable coal tonnage) were determined to be unsuitable for coal mining and surface disturbance associated with coal mining under criterion 2, ROWs and Easements, as associated with Interstate 80 ROWs. In addition, further evaluation and/or mitigation requirements are or may be associated with criteria 9, 11–16, and 19, as discussed above.

- **North Indian Springs:** No unsuitable lands were identified within the North Indian Springs CDPA. However, further evaluation and/or mitigation requirements are or may be associated with criteria 9, 11–16, and 19, as discussed above.

- **Red Rim:** No unsuitable lands were identified within the Red Rim CDPA for criteria 1 and 3–20. Approximately 10 acres (192,000 tons) were determined to be unsuitable for coal mining and surface disturbance associated with coal mining under criterion 2, ROWs and Easements, as associated with U.P.R.R. ROWs. In addition, further evaluation and/or mitigation requirements are or may be associated with criteria 9, 11–16, and 19, as discussed above.

Individual Criteria Analyses

Criterion 1—Federal Land Systems and Federal Lands in Communities

No areas within the identified CDPAs were determined to be unsuitable under this criterion.

Rationale: The identified CDPAs do not include any federal lands in the following land systems or categories: National Park System, National Wildlife Refuge System, National System of Trails, National Wilderness Preservation Systems, National Wild and Scenic Rivers System, National Recreation Areas, lands acquired with money derived from the Land and Water Conservation Fund, National Forests, and/or federal lands in incorporated cities, towns, and villages.

Criterion 2—ROWs and Easement

Certain locations within the Hanna Basin, Indian Springs, and Red Rim CDPAs (see Table A2-3) were determined to be unsuitable for coal mining and related surface operations and impacts because of the existence of ROWs and/or easements.

Table A2-3. Unsuitable Locations for Coal Mining Because of the Existence of ROWs

Coal Development Potential Area	Unsuitable Location(s)	Acres	Coal (tons)
Hanna Basin	Hwy 30/287 ROW	230	88,000
Hanna Basin	U.P.R.R. ROW	210	19,000
Indian Springs	Interstate 80 ROW	20	0
Red Rim	U.P.R.R. ROW	10	192,000

Coal Development Potential Area	Unsuitable Location(s)	Acres	Coal (tons)
Totals		470	299,000

No areas within the Atlantic Rim, Carbon Basin, China Butte, or North Indian Springs CDPAs were determined to be unsuitable under this criterion.

Rationale: After applying the exceptions to this criterion, the federal coal lands along Highway 30/287 as well as those along the U.P.R.R. ROWs (within the Hanna Basin and Red Rim CDPAs) and the coal lands along the Interstate 80 ROWs (within the Indian Springs CDPA) remain unsuitable. Any unforeseen conflicts in these areas should be identified and resolved during the coal activity planning process, during processing of individual coal lease applications, or in mining and reclamation plan developments. There are no identified ROWs or easement conflicts within the Atlantic Rim, Carbon Basin, China Butte, or North Indian Springs CDPAs.

Criterion 3—Buffer Zones for ROWs, Communities, and Buildings

No unsuitable areas were identified with respect to buffer zones for ROWs, communities, and buildings within the CDPAs; however, location-specific unsuitable areas that meet the following criteria may evolve under any proposed coal development scenario(s).

It was determined that a 100-foot buffer zone around cemeteries and a 300-foot buffer zone around occupied dwellings, public buildings, schools, churches, community or institutional buildings, or public parks would be considered unsuitable for coal mining and related surface operations and impacts. This would apply only to the extent such features are identified as being present in any proposed coal development scenario(s), and as such, no determination as to affected acreage or tonnage has been attempted in this coal screening process.

Rationale: Buffer areas for ROWs are unnecessary because ROWs generally have sufficient area to contain their functions. Additionally, if a ROW can be relocated, a buffer would not be necessary.

There are no known occupied dwellings, cemeteries, schools, churches, community or institutional buildings, or public parks on BLM-administered public land surface in the CDPAs. However, there may be some of these structures and facilities on split estate lands (i.e., private/state surface over federal coal), and on nonfederal lands that may be located within 100 to 300 feet of adjacent federal coal lands. Thus, it was determined that a 100-foot buffer zone around cemeteries and a 300-foot buffer zone around occupied dwellings, public buildings, schools, churches, community or institutional buildings, or public parks would be considered "unsuitable" for coal leasing and related surface operations and impacts. Should any conflicts arise, it would be the responsibility of the lease applicant to show that conflicts between mining and the buffer zone would be adequately addressed and mitigated.

Because the numbers and locations of these structures and facilities and the effect they may have on the development of federal coal vary and are unpredictable, it is not possible to make a reasonable estimate of acreage and coal tonnage that may be affected. These situations will be addressed on a case-by-case basis in the course of processing coal lease applications.

Criterion 4—Wilderness Study Areas

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: There are no wilderness study areas within the identified federal CDPAs.

Criterion 5—Scenic Areas

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: There are no Class I visual resource areas designated within the identified federal CDPAs.

Criterion 6—Lands Used for Scientific Study

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: There are no scientific study areas under permit within the identified federal CDPAs.

Criterion 7—Places Included in the National Register of Historic Places

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: There are no places within the identified federal CDPAs that are included in the National Register of Historic Places (NRHP).

Criterion 8—National Natural Landmarks

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: There are no designated National Natural Landmarks within the identified federal CDPAs.

Criterion 9—Federally Listed Endangered Species Habitat

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: No areas were determined to be unsuitable; however, potential habitat areas for threatened and endangered species have not yet been searched to determine whether or not threatened and endangered species are present within the identified federal CDPAs. The necessary searches and consultation with USFWS would be conducted during any coal activity planning.

Criterion 10—State-Listed Endangered Species Habitat

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: This criterion is not applicable because the State of Wyoming recognizes the federal list of endangered species and has no separate list of its own.

Criterion 11—Bald and Golden Eagle Nest Sites

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: It was determined that the federal CDPAs would be acceptable for coal development with the provision that any federal coal lease issued in the area would include a requirement for developing appropriate mitigation measures that would protect the long-term interests of the species involved.

The requirement (or lease stipulation) would be to the effect that the lessee would be required to develop mitigation measures or habitat improvement, development, and reclamation plans (in conjunction with mining and reclamation plan requirements) in consultation with and to the satisfaction of BLM, the USFWS, and the appropriate state agencies. Mitigation measures may include, but are not limited to, seasonal operations in buffer zones around occupied nests, protection of active (not necessarily occupied) nests at all times (unless otherwise provided by the USFWS), off- or on-site habitat improvement or development, special reclamation measures, or other appropriate measures for long-term nest or habitat protection.

Criterion 12—Bald and Golden Eagle Roosts

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: It was determined that the federal CDPAs would be acceptable for coal development with the provision that any federal coal lease issued in the area would include a requirement for developing appropriate mitigation measures that would protect the long-term interests of the species involved.

The requirement (or lease stipulation) would be to the effect that the lessee would be required to develop mitigation measures or habitat improvement, development, and reclamation plans (in conjunction with mining and reclamation plan requirements) in consultation with and to the satisfaction of BLM, the USFWS, and the appropriate state agencies. Mitigation measures may include, but are not limited to, seasonal operations in roosting areas, special reclamation measures, or other appropriate measures for long-term habitat protection.

Criterion 13—Falcon Cliff Nesting Sites

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: It was determined that the federal CDPAs would be acceptable for coal development with the provision that any federal coal lease issued in the area would include a requirement for developing appropriate mitigation measures that would protect the long-term interests of the species involved.

The requirement (or lease stipulation) would be to the effect that the lessee would be required to develop mitigation measures or habitat improvement, development, and reclamation plans (in conjunction with mining and reclamation plan requirements) in consultation with and to the satisfaction of BLM, the USFWS, and the appropriate state agencies. Mitigation measures may include, but are not limited to, seasonal operations in buffer zones around occupied nests, protection of active (not necessarily occupied) nests at all times (unless otherwise provided by the USFWS), off- or on-site habitat

improvement or development, special reclamation measures, or other appropriate measures for long-term nest or habitat protection.

Criterion 14—Migratory Bird Habitat

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: It was determined that the federal CDPAs would be acceptable for coal development with the provision that any federal coal lease issued in the area would include a requirement for developing appropriate mitigation measures that would protect the long-term interests of the species involved.

The requirement (or lease stipulation) would be to the effect that the lessee would be required to develop mitigation measures or habitat improvement, development, and reclamation plans (in conjunction with mining and reclamation plan requirements) in consultation with and to the satisfaction of BLM, the USFWS, and the appropriate state agencies. Mitigation measures may include, but are not limited to, seasonal operations in buffer zones around occupied nests and other important habitat areas, protection of active (not necessarily occupied) nests at all times (unless otherwise provided by the USFWS), off- or on-site habitat improvement or development, special reclamation measures, or other appropriate measures for long-term nest or habitat protection.

Criterion 15—Habitat for State High-Interest Wildlife and Plants

Those coal areas situated within the Muddy Creek watershed (occupying portions of the Atlantic Rim and China Butte CDPAs) were determined to be unsuitable for coal mining and related surface operations and impacts because of the presence of BLM sensitive fish species and habitat (see Table A2-4).

Table A2-4. Unsuitable Locations for Coal Mining Because of BLM Sensitive Fish Species and Habitat

Name of Area	Unsuitable Area(s)	Acres	Coal (Tons)
Atlantic Rim	Portions of T18N; R90W	1,390	19,578,000
China Butte	Portions of T17-18N; R91W	3,130	50,192,000
Totals		**4,520**	**69,770,000**

No areas within the Carbon Basin, Hanna Basin, Indian Springs, North Indian Springs, or Red Rim CDPAs were determined to be unsuitable under this criterion; however, certain habitat areas within these, as well as the remaining CDPAs, would be subject to mitigation requirements as discussed in the Other Habitat Areas section.

Rationale: Those portions of the Atlantic Rim and China Butte CDPAs that are within the Muddy Creek watershed are unsuitable for coal development because of conflicts with BLM sensitive fishes including the Colorado River cutthroat trout, round tail chub, flannelmouth sucker, and bluehead sucker. The Muddy Creek watershed represents the only remaining watershed in Wyoming where the four species can still be found, as confirmed by recent surveys conducted by the WGFD, University of Wyoming, and BLM. Coal development would impact the conservation of these four types of fishes. First, the extraction of coal within the Muddy Creek watershed would degrade the water quality of Muddy Creek and disrupt hydrologic processes that maintain suitable fish habitat. Second, the habitat could be directly removed by mining coal within the

floodplain of Muddy Creek. For these two reasons, it has been determined that the Muddy Creek watershed is unsuitable for coal development.

Other Habitat Areas Suitable for Leasing But Subject to Mitigation Requirements

Other habitat areas within the CDPAs that were determined to be suitable for coal leasing and related surface operations and impacts, but subject to special restrictions and/or mitigation requirements, are identified below.

The primary habitat considerations associated with the CDPAs are elk, deer, and antelope crucial winter or yearlong ranges, and sage-grouse leks and nesting areas. It is anticipated that mitigative measures can be combined with appropriate mining methods to temper the impacts of mining. Therefore, these areas were determined to be suitable for coal development with certain stipulated methods of leasing and mitigation requirements under a concept of long-range leasing and development.

- **Atlantic Rim:** Approximately 3,030 acres of crucial winter and yearlong elk winter range and deer and antelope crucial winter range areas.
- **Carbon Basin:** Various areas identified as deer and antelope crucial winter range and grouse lek and nesting areas.
- **China Butte:** Various areas identified as deer and antelope crucial winter range and grouse lek and nesting areas.
- **Hanna Basin:** Various areas identified as deer and antelope crucial winter range and grouse lek and nesting areas.
- **Indian Springs:** Approximately 2,520 acres of pronghorn crucial winter range.
- **North Indian Springs:** Approximately 2,570 acres of pronghorn crucial winter range.
- **Red Rim:** Approval of any federal mining plan in the Red Rim CDPA must include a condition that restricts from development the pronghorn winter range located within the south portion of the area, until reclamation of pronghorn winter habitat in the north portion of the area has been demonstrated to be successful. It was determined that these CDPAs would be suitable for coal development with a provision that any federal coal lease issued in the respective area(s) would include a requirement for developing appropriate mitigation measures that would protect the long-term interests of the species and habitats involved. The requirement (or stipulation) would be to the effect that the lessee would be required to develop mitigation measures or habitat improvement, development, and reclamation plans (in conjunction with mining and reclamation plan requirements) in consultation with and to the satisfaction of BLM and the appropriate state agencies. Mitigation may include, but is not limited to, seasonal operations in some areas, off- or on-site habitat improvement or development, special reclamation measures (e.g., habitat recovery), timing and sequencing of mining or other appropriate measures for long-term nest or habitat protection, seasonal operations in roosting areas, special reclamation measures, or other appropriate measures for long-term nest or habitat protection.
- **Deer and Antelope Crucial Winter Range Considerations:** With respect to deer and antelope crucial winter range, mitigative measures would be combined with appropriate mining methods to temper the impacts of mining in these areas under a concept of maintaining a long-term balance between habitat and coal development. If all or a significant part of the crucial winter range for one or more big game species were to be mined or made available for mining during one time

span, there probably would be significant long-term impacts on the survival of the herd. However, in considering the exceptions to the criterion, the BLM determined that there will not be significant long-term impacts on the species being protected under certain mining method stipulations (i.e., habitat recovery, limited surface occupancy, or other mitigation requirements) or under sequential mining over a long period to maintain a proper mix and balance between undisturbed areas and those areas disturbed by mining.

- **Elk Winter and Yearlong Range Considerations:** With respect to elk winter and yearlong range, the federal CDPAs will be subject to mitigation and reclamation measures for the protection of wintering and yearlong resident elk. Any proposal by the lessee to conduct mining operations or construct mining-related surface facilities within the federal CDPAs will be subject to stipulations for specific placement, design, and type of facilities; management of elk forage; and restrictions on the level of mining and human activity. These stipulations and restrictions will be developed in consultation with WGFD and in conference with the USFWS, the Wyoming Wildlife Federation, and the National Wildlife Federation. In particular, the primary habitat consideration within the Atlantic Rim CDPA is crucial winter and yearlong range for elk. The elk rely on a total yearlong range of 784,000 acres, of which about 327,000 acres is winter range and about 131,000 acres (17 percent of the total range) is crucial habitat. Approximately 3,030 federal acres of this crucial habitat lie within the Atlantic Rim CDPA. The area will be subject to mitigation and reclamation measures for the protection of wintering and yearlong resident elk. Any proposal to conduct mining operations or construct mining-related surface facilities within the Atlantic Rim CDPA will be subject to stipulations for specific placement, design, and type of facilities; management of elk forage; and restrictions on the level of mining and human activity. These stipulations and restrictions will be developed in consultation with WGFD and in conference with the USFWS, the Wyoming Wildlife Federation, and the National Wildlife Federation.

- **Grouse Lek and Nesting Area Considerations:** With respect to grouse breeding (leks) and nesting, it was determined that grouse habitat areas are acceptable for coal leasing with stipulations and mitigation requirements for habitat improvement, development, and reclamation. Exploration activities and ancillary facilities would be allowed, provided: (1) the surface disturbing activities related to exploration and ancillary facility development avoid any lek and areas within a ¼-mile distance around any lek, if possible, and where not possible, intensive mitigation would be applied; (2) permanent and high-profile structures, such as buildings, overhead power lines, other types of ancillary facilities, etc., are prohibited within a ¼-mile distance from any lek area; (3) during the grouse mating season, surface uses and activities would be prohibited between the hours of 6:00 p.m. and 9:00 a.m. within a ½-mile distance from the leks; (4) surface disturbance in the nesting area within a 2-mile radius of a lek were limited to only actual mining activity and other activities were subject to seasonal limitations; and (5) it were attempted to relocate lek and nesting complexes that are disturbed or destroyed by coal mining (relocation efforts are to be coordinated with the BLM, WGFD, and other appropriate state agencies).

Criterion 16—Riverine, Coastal, and Special Floodplains

Certain floodplain areas associated with the Medicine Bow River that are present within the Carbon Basin CDPA were determined in 1988 to be "unsuitable" for coal leasing and related surface operations and impacts (however, no mineable coal was determined to be present).

Table A2-5. Unsuitable Locations for Coal Mining in Certain Floodplains of the Medicine Bow River

Area	Unsuitable Location	Acres	Coal (Tons)
Carbon Basin	Portions of Sec. 12; T20N; R80W	30	0

No areas were determined to be unsuitable under this criterion in the Atlantic Rim, China Butte, Hanna Basin, Indian Springs, North Indian Springs, or Red Rim CDPAs because there are no proven riverine, coastal, or special floodplains within these areas, until an LBA is filed and analyzed, and coal screening process is completed and proven otherwise.

There are riparian and wetland habitat areas mapped within each of the CDPAs; however, because no official delineation of the 100-year floodplain has been completed in the CDPAs, the riparian and wetland habitat areas will be further evaluated and the 100-year floodplain determined when addressing potential coal leasing (on a case-by-case basis). These areas should be evaluated prior to allowing any disturbance from surface mining.

Rationale: With the exception of the small areas of the Medicine Bow River floodplain within the Carbon Basin coal development potential area, it was determined that the other floodplain areas (inclusive of the Separation Creek floodplain within the Red Rim CDPA and the Fillmore Creek floodplain within the China Butte CDPA) can generally be mined in such a manner that all or certain stipulated methods of coal mining can be undertaken without substantial threat of loss to people or property and to the natural and beneficial values of the floodplain, either on a coal lease tract or downstream. Examples of such stipulations or lease requirements may include, but are not limited to, relocation of channels during mining and restoration of channel locations after mining, controlling sediment yields and prohibiting spoil dumping in channels, lining channel bottoms, revegetation, and general mined land reclamation.

Criterion 17—Municipal Watersheds

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: No municipal watersheds have yet been identified within the federal CDPAs, until an LBA is filed and analyzed, and the coal screening process is completed and proven otherwise.

Criterion 18—National Resource Waters

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: No National Resource Waters (Class I waters including the ¼-mile buffers), within the identified federal CDPAs have been identified by the State of Wyoming in its water quality management plan. However, it should be noted that the Hanna Basin CDPA is located upstream of National Resource Waters, specifically along the North Platte River and below Seminoe Reservoir.

Criterion 19—Alluvial Valley Floors

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion, until an LBA is filed and analyzed, and the coal screening process is completed and proven otherwise.

Rationale: No alluvial valley floors have been identified by the State of Wyoming within the identified federal CDPAs. The State of Wyoming usually identifies alluvial valley floor areas and mitigative measures during the mine plan approval and mine permitting stage. The CDPAs remain acceptable for further leasing consideration subject to the condition that in potential alluvial valley floors, or in other areas near them, where coal mining could interrupt or intercept water flow to farming areas along the drainages, mining will be permitted only with mitigative measures that are made a part of an approved mine plan.

Criterion 20—Unsuitability Criterion Proposed by a State or by an Indian Tribe

No areas within the identified federal CDPAs were determined to be unsuitable under this criterion.

Rationale: Neither the State of Wyoming nor any Indian tribes have proposed any unsuitability criteria to the Secretary of the Interior. Until an LBA is filed and analyzed, and the coal screening process is completed and proven otherwise, the above statement is true.

Step 3—Multiple-Use Conflicts

Procedurally, in this step of the coal screening process, those lands that are determined to be suitable for further coal leasing consideration after applying the unsuitability criteria would be further evaluated. This evaluation would involve consideration of potential conflicts of coal development with other multiple-use values (i.e., values not only or directly concerned with the unsuitability criteria) and identification of any additional areas that would be considered unacceptable for coal mining or related surface operations and impacts. The evaluation of other multiple-use conflicts typically involves a somewhat complicated procedure of sequentially analyzing and developing the various coal management scenarios.

As stated before, the coal screening procedures consist of four steps, identification of coal development potential, application of coal unsuitability, multiple-use conflict evaluation, and surface owner consultation. Based on the completion of unsuitability, Step 2 of this process, no additional areas over and above the areas determined unsuitable during the 1998 EA were identified for the Carbon Basin areas. As a result, the Carbon Basin coal decision has identified 12,120 acres (federal acreage) and 210 million tons of coal as acceptable for further consideration for leasing. This scenario is still valid and has been made part of the actions identified in Chapter 2 of the EIS.

It has been determined from Step 2 of the process, that there is minimal likelihood for actual coal development to occur within the RMPPA and the applicable 20-year planning period. It was also determined that Step 3 of the coal screening process would not be carried out until an LBA is filed and analyzed. Therefore, the areas determined acceptable through Step 2 of the coal screening process will be the areas available for consideration for coal mining by the industry.

Step 4—Surface Owner Consultation

It has been determined from Step 2 of the process that there is minimal likelihood for actual coal leasing and development within the RMPPA and the applicable 20-year planning period. It was also determined that Step 4 of the coal screening process would not be carried out until a LBA is filed and analyzed. Therefore, the areas determined "acceptable" through Step 2 of the coal screening process will be the areas available for consideration for coal mining by the industry.

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APPENDIX 3—WILD AND SCENIC RIVER DESIGNATION PROCESS

As part of the planning effort for developing the Rawlins Resource Management Plan (RMP), the Bureau of Land Management (BLM) planning team members initiated a Wild and Scenic Rivers (WSR) review of all BLM-administered public land surfaces (public lands) along waterways within the Rawlins RMP planning area. This review was to determine whether any of these public lands would meet the WSR eligibility criteria and suitability factors, as identified in the Wild and Scenic Rivers Act of 1968, as amended.

The BLM WSR review includes a three-step process:

- Determining whether public lands along waterways meet the WSR eligibility criteria to be tentatively classified as wild, scenic, or recreational
- Determining whether any of those public lands that meet the eligibility criteria also meet the WSR suitability factors
- Determining how public lands that are determined suitable for designation will be managed.

The initial WSR review was conducted separately from the RMP planning process to expedite the review process, resulting in a stand-alone WSR review report that will support the land use plan update efforts currently underway in the Rawlins Field Office. Any comments made by the public concerning the determinations made in this review will be taken into consideration and documented in the RMP planning process. This WSR eligibility review may be modified if deemed necessary as a result of public comments. The final report and interim management prescriptions will be included in the revision of the RMP.

The Rawlins Wild and Scenic Rivers Review Report may be viewed at www.rawlinsrmp.com under "documents and bulletins."

APPENDIX 4—AIR QUALITY IMPACT TECHNICAL SUPPORT DOCUMENT

The following technical support document describes the processes used to conduct the air quality impact assessment for the air resources in the Rawlins Resource Management Plan Planning Area (RMPPA), and provides summaries of relevant analysis data. This document will serve as the basis for subsequent air quality impact analyses of other alternatives and the preferred alternative. The contents of this document are as follows:

- Regulatory Framework
- Agency Roles and Authorities
- Existing Air Quality
- Air Quality Impact Analysis
- Emission Calculations
- Internet Resources
- Mitigation

Copies of this technical support document and any data files are available upon request from—

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REGULATORY FRAMEWORK

For quantitative analysis, the following air quality criteria apply. Although criteria listed below do not apply to the qualitative analysis presented in the Rawlins Air Quality Analysis, they are identified here for reference purposes. The basic framework for controlling air pollutants in the United States is mandated by the 1970 Clean Air Act (CAA) and its amendments, and the 1999 Regional Haze Regulations. The CAA addresses criteria air pollutants, State and national ambient air quality standards for criteria air pollutants, and the Prevention of Significant Deterioration program. The Regional Haze Regulations address visibility impairment.

Ambient Air Quality Constituents

Air pollutants addressed in this study include criteria pollutants; hazardous air pollutants (HAP); and sulfur and nitrogen compounds, which could cause visibility impairment or atmospheric deposition impacts.

Criteria Pollutants

Criteria pollutants are those for which national standards of concentration have been established. Ambient air concentrations of these constituents greater than the standards represent a risk to human

health. Criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), particulate matter (PM_{10}, $PM_{2.5}$), and lead (Pb).

Carbon Monoxide. CO is an odorless, colorless gas formed during any combustion process, such as operation of engines, fireplaces, and furnaces. High concentrations of CO affect the oxygen-carrying capacity of the blood and can lead to unconsciousness and asphyxiation. Wildfires are natural sources of CO.

Nitrogen Dioxide. NO_2 is a red-brown gas formed during operation of internal combustion engines. Such engines emit a mixture of nitrogen gases, collectively called nitrogen oxides (NO_x). NO_x can contribute to brown cloud conditions and can convert to ammonium nitrate particles and nitric acid, which can cause visibility impairment and acid rain. Bacterial action in soil can be a natural source of nitrogen compounds.

Sulfur Dioxide. SO_2 forms during combustion from trace levels of sulfur in coal or diesel fuel. It can convert to ammonium sulfate ($(NH_4)_2SO_4$) and sulfuric acid (H_2SO_4), which can cause visibility impairment and acid rain. Volcanoes are natural sources of SO_2. Anthropogenic sources include refineries and power plants.

Ozone. O_3 is a gas that is generally not emitted directly into the atmosphere but is formed from NO_x and volatile reactive organic compound (VOC) emissions. As stated above, internal combustion engines are the main source of NO_x. Volatile organic compounds, such as terpenes, are very reactive. Sources of VOCs include, but are not limited to, paint, varnish, and some types of vegetation. The faint acrid smell common after thunderstorms is caused by ozone formation by lightning. O_3 is a strong oxidizing chemical that can burn lungs and eyes, and damage plants.

Particulate Matter. Particulate matter (e.g., soil particles, hair, pollen) is essentially small particles suspended in the air that settle to the ground slowly and may be re-suspended if disturbed. Separate allowable concentration levels for particulate matter are based on the relative size of the particle:

- PM_{10} particles, particles with diameters of less than 10 micrometers, are small enough to be inhaled and can cause adverse health effects.
- $PM_{2.5}$ particles, particles with diameters of less than 2.5 micrometers, are so small that they can be drawn deeply into the lungs and cause serious health problems. Particles in this size range are also the main cause of visibility impairment.

Lead. Before use of unleaded fuel for automobiles became widespread, lead particles were emitted from automobile tailpipes. Lead is not considered in this environmental impact statement (EIS) because no proposed projects are expected to emit lead. The lead standard also will not be addressed in this Technical Support Document because lead is not a current concern, but it will be considered in future projects.

Hazardous Air Pollutants

There are a wide variety of HAPs, including N-hexane, ethylbenzene, toluene, xylene, formaldehyde, and benzene. Although HAPs do not have ambient air quality standards, the U.S. Environmental Protection Agency (EPA) has issued reference concentrations for evaluating the inhalation risk for cancerous and noncancerous health effects, known as Reference Concentrations for Chronic Inhalation (RfC).

The EIS associated with the Rawlins resource management plan (RMP) is a National Environmental Policy Act (NEPA) document and not a regulatory document, but the Record of Decision is binding and a

"public record" (see 40 CFR 1505.2). Additionally, there are regulatory issues that should be taken into account in preparing this EIS and ensuing project-specific EISs. Actual regulation of HAPs is achieved through compliance with the applicable maximum achievable control technology (MACT) standards and not through ambient air quality standards. Regulatory agencies implement control through Section 112 programs, specifically Section 112(g) case-by-case MACT determinations based on 40 Code of Federal Regulations (CFR) Part 63, Subpart B and Section 112(d) MACT emission standards.

Any source that emits or has the potential to emit 10 tons per year or more of any HAP or 25 tons per year or more of any combination of HAPs is considered a major source and will require a Title V, Part 70 operating permit review and permit. This may include either a case-by-case 112(g) MACT determination, if the source is new or has had major modifications and no applicable MACT emission standard has been promulgated, or compliance with an applicable MACT emission standard. Specific regulations that apply in the Rawlins RMPPA include 40 CFR Part 63 Subpart HH, National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities; 40 CFR Part 63 Subpart HHH, National Emission Standards for Hazardous Air Pollutants From Natural Gas Transmission and Storage Facilities; and 40 CFR Part 63 Subpart ZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. This last regulation, new in 2004, affects source categories using reciprocating engines for gas compression.

For quantifiable analysis, short-term (1-hour) HAP concentrations would be compared to acute Reference Exposure Levels (RELs). RELs are defined as concentrations at or below which no adverse health effects are expected. If no RELs were available for ethylbenzene and n-hexane, the available Immediately Dangerous to Life or Health (IDLH) values would be used. These IDLH values are determined by the National Institute for Occupational Safety and Health (NIOSH) and would be obtained from EPA's Air Toxics Database.

For quantifiable analysis, long-term exposure to HAPs emitted by the Proposed Action would be compared to RfCs. An RfC is defined by EPA as the daily inhalation concentration at which no long-term adverse health effects are expected. RfCs exist for both noncarcinogenic and carcinogenic effects on human health. Annual modeled HAP concentrations for all HAPs emitted would be compared directly to the noncarcinogenic RfCs. RfCs for the suspected carcinogens benzene and formaldehyde are expressed as risk factors. Accepted methods of risk assessment would be used to evaluate the incremental cancer risk from these pollutants.

Annual modeled concentrations would be multiplied by EPA's unit risk factors (URF) (based on 70-year exposure) for those pollutants, and then the product would be multiplied by an adjustment factor, which represents the ratio of projected exposure time to 70 years. The adjustment factors represent two scenarios: a most likely exposure (MLE) scenario and one reflective of the maximally exposed individual (MEI).

The MLE duration would be assumed to be 9 years, which corresponds to the mean duration that a family remains at a residence. This duration corresponds to an adjustment factor of $9/70 = 0.13$. The duration of exposure for the MEI is assumed to be 50 years (i.e., the Life of Project [LOP]), corresponding to an adjustment factor of $50/70 = 0.71$.

A second adjustment would be made for time spent at home versus time spent elsewhere. For the MLE scenario, the at-home time fraction is 0.64 (EPA 1993), and it would be assumed that during the rest of the day the individual remained in an area where annual HAP concentrations were one quarter as high as the maximum annual average concentration. Therefore, the MLE adjustment factor would be $(0.13) \times [(0.64 \times 1.0) + (0.36 \times 0.25)] = 0.0949$. The MEI scenario would assume that the individual was at home 100 percent of the time, for a final adjustment factor of $(0.71 \times 1.0) = 0.71$.

HAP emissions are associated with industrial activities, such as oil and gas operations, refineries, paint shops, dry cleaning facilities, and wood working shops.

Because this analysis is qualitative, no specific analysis of either short- or long-term HAP impacts is made.

HAP emissions in the RMPPA are expected to be similar to those found in the Desolation Flats EIS and comprise of benzene, toluene, ethylbenzene, xylene, n-hexane, and formaldehyde.

Atmospheric Deposition Constituents

Sulfur and nitrogen compounds that can be deposited in terrestrial and aquatic ecosystems include nitric acid (HNO_3), nitrate (NO_3^-), ammonium (NH_4^+), and sulfate (SO_4^{--}). Nitric acid (HNO_3), and nitrate (NO_3^-) are not emitted directly into the air but form in the atmosphere from industrial and automotive emissions of NO_x. Sulfate (SO_4^{--}) is formed in the atmosphere from industrial emission of sulfur dioxide (SO_2). Deposition of HNO_3, NO_3^-, and SO_4^{--} can adversely affect plant growth, soil chemistry, lichens, aquatic environments, and petroglyphs. Ammonium (NH_4^+) is primarily associated with feedlots and agricultural fertilization. Deposition of NH_4^+ can affect terrestrial and aquatic vegetation. Although deposition may be beneficial as a fertilizer, it can adversely affect the timing of plant growth and dormancy.

Although this analysis will be qualitative, future specific projects will require quantitative analyses using the following criteria.

Wyoming and National Ambient Air Quality Standards

Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS) are health-based standards for the maximum concentration of air pollutants at all locations to which the public has access. The WAAQS and NAAQS are legally enforceable standards. Concentrations above the WAAQS and NAAQS represent a risk to human health. State standards must be as strict as, or more strict than, federal standards.

EPA has developed standards for each criteria pollutant for a specific averaging time (see Table A4-1). Short averaging times (1, 3, and 24 hours) address short-term exposure while the annual standards address long-term exposure. Longer term standards are set to lower allowable concentrations than are short-term standards to recognize the cumulative effects of long-term exposure.

Prevention of Significant Deterioration

The goal of the Prevention of Significant Deterioration (PSD) program is to ensure that air quality in areas with clean air does not significantly deteriorate, while maintaining a margin for future industrial growth. Under PSD, each area in the United States is classified by the air quality in that region according to the following system:

- **PSD Class I Areas.** Areas with pristine air quality, such as wilderness areas, national parks, and some Indian reservations, are accorded the strictest protection. Only very small incremental increases in pollutant concentrations are allowed in order to maintain the very clean air quality in these areas.
- **PSD Class II Areas.** Essentially, all areas that are not designated as Class I are designated as Class II. Moderate incremental increases in pollutant concentrations are allowed, although the

concentrations are not allowed to reach the concentrations set by Wyoming and federal standards (WAAQS and NAAQS).

- **PSD Class III Areas.** No areas have yet been designated as Class III. Concentrations would be allowed to increase all the way to the WAAQS and NAAQS.

The incremental increases allowed for specific pollutants in Class I and Class II areas are provided in Table A4-2.

Comparisons of potential PM_{10}, NO_2, and SO_2 concentrations with PSD increments are intended only to evaluate a threshold of concern and do not represent a regulatory PSD increment consumption analysis. Regulatory PSD increment consumption analyses are solely the responsibility of the State of Wyoming, which has been granted primacy (with EPA oversight) under the CAA.

In project-specific EISs, the Bureau of Land Management (BLM) does not expect that a PSD analysis will be performed. Rather the PSD standards are used only as a reference to give the public a better understanding of the level of potential impact.

Regional Haze Regulations

Visibility impairment in the form of regional haze obscures the clarity, color, texture, and form of what we see. Haze-causing pollutants (mostly fine particles) are directly emitted into the atmosphere or are formed when gases emitted into the air form particles as they are carried downwind. Emissions from human-caused and natural sources can be carried great distances, contributing to regional haze. The Wyoming Department of Environmental Quality–Air Quality Division (WDEQ-AQD) submitted its Regional Haze State Implementation Plan (SIP) in accordance with 40 CFR, Part 51.309, in December 2003. EPA has not yet taken action on this SIP.

Visual range, one of several ways to express visibility, is the furthest distance at which a person can distinguish a dark landscape feature from a light background like the sky. Without human-caused visibility impairment, natural visual range is estimated to average about 110–115 miles in the western United States and 60–80 miles in the eastern United States (Malm 1999).

The Regional Haze Regulations were developed by EPA in response to the CAA Amendments of 1977 and 1990. They are intended to maintain visibility on the least impaired days and to improve visibility on the most impaired days in mandatory federal Class I areas across the United States so that visibility in these areas is returned to natural conditions by the year 2064. These regulations require states to submit a regional haze SIP and progress reports to demonstrate reasonable progress toward the 2064 goal.

Table A4-1. National and Wyoming Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS			WAAQS		
		(µg/m3)	(ppm)	(ppb)	(µg/m3)	(ppm)	(ppb)
Carbon Monoxide CO	1 hour	40,000	35	35,000	40,000	35	35,000
	8 hour	10,000	9	9,000	10,000	9	9,000
Lead Pb	Calendar quarter	1.5			1.5		
Nitrogen Dioxide NO_2	Annual	100	.053	53	100	.053	53
Ozone O_3	1 hour	235	.12	120	235	.12	120
	8 hour	157	.08	80	157	.08	80
Particulate Matter PM_{10}	24 hour	150			150		
	Annual	50			50		
Particulate Matter $PM_{2.5}$	24 hour	65			65		
	Annual	15			15		
Sulfur Dioxide SO_2	3 hour	1300	.5	500	695	.266	266
	24 hour	365	.14	140	260	.099	99
	Annual	80	.030	30	60	.023	23

Table A4-2. PSD Increments

Pollutant	Averaging Time	PSD Increment					
		Class I			Class II		
		(µg/m3)	(ppm)	(ppb)	(µg/m3)	(ppm)	(ppb)
Nitrogen Dioxide NO_2	Annual	2.5	.0013	1.3	25	.013	13
Particulate Matter PM_{10}	24 hour	8			30		
	Annual	4			17		
Sulfur Dioxide SO_2	3 hour	25	.0096	9.6	512	.1956	196
	24 hour	5	.0019	1.9	91	.0348	35
	Annual	2	.0008	.8	20	.0076	8

APPLICABILITY TO THE RAWLINS AREA

Air pollution impacts are limited by local, state, tribal, and federal air quality regulations, standards, and implementation plans established under the CAA and administered by the WDEQ-AQD with oversight from EPA. Air quality regulations require that proposed new, or modified existing, air pollutant emission stationary sources (including oil and gas compression facilities) undergo a permitting review before their construction can begin. Therefore, the WDEQ-AQD has the primary authority and responsibility to review permit applications and to require emission permits, fees, and control devices, before construction or start of operation.

Fugitive dust and exhaust from construction activities, along with air pollutants emitted during operation (e.g., well operations, booster [field] and pipeline [sales] compressor engines), are potential causes of air quality impacts. These issues are more likely to generate public concern where natural gas development activities occur near residential areas or near sensitive Class I and Class II areas.

The Forest Service (FS), the National Park Service (NPS), and the Fish and Wildlife Service (FWS) have also expressed concerns about potential atmospheric deposition (acid rain) and visibility impacts within

downwind PSD Class I and PSD Class II sensitive areas under their administration, located throughout Wyoming.

The NAAQS and the WAAQS are health-based standards for the maximum acceptable concentrations of air pollutants at locations to which the public has access. The analysis of the proposed alternatives must demonstrate continued compliance with all applicable local, state, tribal, and federal air quality standards. Existing air quality throughout the project area is in attainment of all ambient air quality standards, as demonstrated by the relatively low concentration levels presented in Table A4-3.

Air quality regulations require that stationary proposed new, or modified existing air pollutant emission sources (including oil and gas compression facilities) undergo a permitting review before their construction can begin. Therefore, the WDEQ-AQD has been given primary authority over and responsibility for reviewing permit applications and for requiring emission permits, fees, and control devices, before construction and/or operation. In addition, the U.S. Congress (through the CAA Section 116) authorized local, state, and tribal air quality regulatory agencies to establish air pollution control requirements more (but not less) stringent than federal requirements. Also, under both the Federal Land Policy and Management Act (FLPMA) and the CAA, BLM cannot authorize any activity that would not conform to all applicable local, state, tribal, and federal air quality laws, regulations, standards, and implementation plans.

Given the project area's current attainment status, future development projects that have the potential to emit more than 250 tons per year of any criteria pollutant (or certain listed sources that have the potential to emit more than 100 tons per year) would be required to undergo a site-specific regulatory PSD increment consumption analysis under the federal New Source Review permitting regulations. Development projects that require PSD permits may also be required by the applicable air quality regulatory agencies to incorporate additional emission control measures (including a Best Available Control Technology [BACT] analysis and determination) to ensure protection of air quality resources and to demonstrate that the combined impacts of all PSD sources will not exceed the allowable incremental air quality impacts for NO_2, PM_{10}, and SO_2. Minor sources having emissions below the cutoff rates mentioned above do not require PSD permits; nevertheless, their emissions consume increment.

A regulatory PSD increment consumption analysis may be conducted, either as part of a New Source Review or independently. The determination of PSD increment consumption is a legal responsibility of the applicable air quality regulatory agencies, with EPA oversight. In addition, an analysis of cumulative impacts due to all existing sources and the permit applicant's sources is required during New Source Review to demonstrate that applicable ambient air quality standards will be met during the operational lifetime of the permit applicant's operations.

Sources subject to the PSD permit review procedure are also required to demonstrate potential impacts on air quality–related values (AQRV). These include visibility impacts, degradation of mountain lakes due to atmospheric deposition (acid rain), and effects on sensitive flora and fauna in Class I areas. The CAA also provides specific visibility protection procedures for the mandatory federal Class I areas designated by the U.S. Congress on August 7, 1977, which included wilderness areas greater than 5,000 acres in size, as well as national parks and national memorial parks greater than 6,000 acres in size as of that date.

AGENCY ROLES AND AUTHORITIES

EPA

EPA administers the Federal CAA (42 U.S. Code [U.S.C.] 7401 et seq.) to maintain the NAAQS that protect human health and to preserve the rural air quality in the region by ensuring the PSD Class I and Class II increments for SO_2, NO_2, and PM_{10}, are not exceeded. EPA has delegated this CAA authority to the State of Wyoming.

Wyoming DEQ

Wyoming regulates pollutants emitted into the air through the Wyoming Environmental Quality Act (W.S. 35-11-101 et seq.). Wyoming is also authorized by an approved SIP to administer all requirements of the PSD permit program under the CAA. In addition, the approved Wyoming SIP contains a number of programs that provide for the implementation, maintenance, and enforcement of the NAAQS, including a New Source Review program for minor source permitting that requires, among other things, application of BACT for all new or modified sources, regardless of size or source category. Included as well are authorities for the control of particulate emissions, including fugitive particulate emissions from haul roads, access roads, or general facility boundaries. Wyoming is also delegated responsibility for operating an approved ambient air quality monitoring network for the purpose of demonstrating compliance with the NAAQS and the WAAQS.

Bureau of Land Management

NEPA requires that federal agencies consider mitigation of direct, indirect, and cumulative impacts during their preparation of an EIS (BLM Land Use Planning Manual 1601). Under the CAA, federal agencies are to comply with SIPs regarding the control and abatement of air pollution. Before approval of RMPs or amendments to RMPs, the state director is to submit any known inconsistencies with SIPs to the governor of that state. If the governor of the state recommends changes in the proposed RMP or amendment to meet SIP requirements, the state director shall give the public an opportunity to comment on those recommendations. (BLM Land Use Planning Manual, Section 1610.3-2.)

Forest Service

The FS administers national forests, which include several wilderness areas (WA) that could be affected by direct effects associated with the project: Bridger WA; Fitzpatrick WA; Rawah WA; and Mount Zirkel WA with mandatory federal Class I designation. In addition, Washakie, Teton, and Savage Run WAs and the Class II Popo Agie must be included in the RMPPA analysis. As federal land mangers, the USFS could act in a consultative role to recommend that the BLM impact analysis results, or any future EPA- or state-administered PSD refined impact analysis results (if justified), trigger adverse impairment status. If the FS determines impairment of WAs, BLM, the state, and/or EPA might need to mitigate this predicted adverse air quality effect.

National Park Service

One area administered by the NPS with a mandatory federal Class I area designation, Rocky Mountain National Park, could be affected by direct effects associated with the Rawlins Field Office BLM emissions. As federal land mangers, the NPS could act in a consultative role to recommend that the BLM impact analysis results, or any future EPA- or state-administered PSD refined impact analysis results (if

justified), trigger adverse impairment status. If the NPS determines impairment of NPS-administered Class I areas, BLM, the state, and/or EPA might need to mitigate this predicted adverse air quality effect.

EXISTING AIR QUALITY

As described in Chapter 3.2, Affected Environment (Air Resources), specific air quality monitoring is not conducted throughout most of the project area, but air quality conditions are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations. Table A4-3 summarizes the ambient air quality background concentrations in the RMPPA. This information was provided by WDEQ. Although monitoring is primarily conducted in urban or industrial areas, the data selected are considered to be the best available representation of background air pollutant concentrations throughout the project area. The assumed background pollutant concentrations are below applicable ambient air quality standards for all pollutants and averaging times (although ozone levels approach the standards). These national and Wyoming standards, and PSD increment values are also presented in Tables A4-1 and A4-2.

Table A4-3. Assumed Background Concentrations and Applicable Ambient Air Quality Standards and PSD Increment Values (in µg/m^3)

Averaging Time	Measured Background Concentration (µg/m3)	Percent of Standards (%)		Data Source
		NAAQS	WAAQS	
Carbon Monoxide (CO)				Data collected by Amoco at Ryckman Creek for an 8-month period during 1978–1979, summarized in the Riley Ridge EIS
1-hour	3,336	8	8	
8-hour	1,381	14	14	
Nitrogen Dioxide (NO_2)				Data collected at Green River Basin Visibility Study Site, Green River, Wyoming, during January–December 2001 (ARS 2002)
Annual	3.4	3	3	
Ozone				Data collected at Green River Basin Visibility Study Site, Green River, Wyoming, during June 10, 1998, through December 31, 2001(ARS 2002)
1-hour	169	72	72	
8-hour	147	94	94	
Particulate Matter (PM_{10})				Data collected by WDEQ at Emerson Building, Cheyenne, Wyoming, Year 2002 (WDEQ)
24-hour	47	31	31	
Annual	16	32	32	
Particulate Matter ($PM_{2.5}$)				Data collected by WDEQ at Emerson Building, Cheyenne, Wyoming, Year 2002 (WDEQ)
24-hour	15	23	23	
Annual	5	33	33	
Sulfur Dioxide (SO_2)				Data collected at LaBarge Study Area at the Northwest Pipeline Craven Creek site 1982–1983
3-hour	132	10	19	
24-hour	43	12	17	
Annual	9	11	15	

Data provided by the WDEQ-AQD
Note: µg/m3 = micrograms per cubic meter

Air Quality Impact Assessment

As described in Chapter 4, Environmental Consequences (Air Quality), a qualitative emission comparison approach was used. A qualitative method was selected because of (1) lack of specific project information on location, types, and magnitude of potential projects and (2) time constraints in completing the analysis.

Emissions calculations were based on the best available engineering data and assumptions; air, visibility, and atmospheric deposition data; and emission inventory procedures, as well as on professional and scientific judgment. However, where specific data or procedures were not available, assumptions were incorporated.

Maximum potential near-field particulate matter emissions from traffic on unpaved roads and during well pad construction were used to estimate emissions for $PM_{2.5}$ and PM_{10} impacts. Maximum air pollutant emissions from each oil and gas well would be temporary (i.e., occurring during an average of a 12-day construction period) and would occur in isolation, without significantly interacting with adjacent well locations. Particulate matter emissions from well pad and resource road construction would be minimized by application of water and/or chemical dust suppressants. The control efficiency of these dust suppressants was computed at 50 percent during construction. During well completion testing, natural gas could be burned (flared) on an average of 2 days (refer to emission CD for details).

For any future projects, significance criteria for potential air quality impacts will include local, state, tribal, and federally enforced legal requirements to ensure that air pollutant concentrations remain within specific allowable levels. These requirements and legal limits are presented in Table A4-1. Because neither the WDEQ-AQD nor EPA has established ambient HAP standards, only emissions were calculated.

Because the potential air pollutant emission sources comprise many small sources spread out over a very large area, discrete visible plumes are not likely to impact the distant sensitive areas, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Regional haze degradation is caused by fine particles' and gases' scattering and absorbing light. Potential changes to regional haze are calculated in terms of a perceptible "just noticeable change" (1.0 deciview [dv]) in visibility when compared to background conditions. A 1.0 dv change is considered potentially significant in mandatory federal PSD Class I areas as described in the EPA Regional Haze Regulations (40 CFR 51.300 et seq.), and as originally presented in Pitchford and Malm (1994). A 1.0 dv change is defined as about a 10 percent change in the extinction coefficient (corresponding to a 2 to 5 percent change in contrast, for a black target against a clear sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes in mandatory federal Class I areas.

It should be noted that a 1.0 dv change is not a "just noticeable change" in all cases for all scenes. Visibility changes of less than 1.0 dv are likely to be perceptible in some cases, especially where the scene being viewed is highly sensitive to small amounts of pollution, as in the case of preferential forward light scattering. Under other view-specific conditions, such as where the sight path to a scenic feature is less than the maximum visual range, a change of greater than 1.0 dv might be required to produce a "just noticeable change." However, any future project-specific NEPA analyses will not be designed to predict specific visibility impacts for specific views in specific mandatory federal Class I areas based on specific project designs but to characterize reasonably foreseeable visibility conditions that are representative of a fairly broad geographic region, based on emission source assumptions. This approach is consistent with both the nature of regional haze and the requirements of NEPA. At the time of a preconstruction air quality PSD permit review, the WDEQ-AQD may require a much more detailed visibility impact analysis. Factors such as the magnitude of change, frequency, time of year, and meteorological

conditions during times when predicted visibility impacts are above the 1.0 dv threshold (as well as inherent conservatism in the impact analyses) should all be considered in assessing the significance of predicted impacts.

The FS, NPS, and FWS have published their *Final FLAG Phase I Report* (*Federal Register,* Vol. 66, No. 2, January 3, 2001), providing "...a consistent and predictable process for assessing the impacts of new and existing sources on AQRVs..." including visibility. For example, the FLAG report states, "A cumulative effects analysis of new growth (defined as all PSD increment-consuming sources) on visibility impairment should be performed," and further, "If the visibility impairment from the proposed action, in combination with cumulative new source growth, is less than a change in extinction of 10% [1.0 dv] for all time periods, the FLMs will not likely object to the proposed action."

Estimation of Emission Factors

For natural gas compressor engines, the emissions of nitrogen oxides, CO, and formaldehyde are determined by the average permitted emission rate allowed by the state under BACT processes. For fugitive dust impacts, emission rates are obtained from EPA's *AP-42* document titled *A Compilation of Air Pollutant Emission Factors*. An *AP-42* emission factor is a representative value that attempts to relate the quantity of a pollutant released into the atmosphere with an activity associated with the release of that pollutant. Emission factors may be appropriate to use in a number of situations, such as in making source-specific emission estimates for areawide inventories. These inventories have many purposes, including ambient dispersion modeling and analysis, control strategy development, and screening sources for compliance investigations. In most cases, these factors are simply averages of all available data of acceptable quality and are generally assumed to be representative of long-term averages for all sources in a specific category.

Emission Assumptions

When reviewing the emission inventory it is important to understand that assumptions were made regarding development. For example, there is uncertainty regarding ultimate development of energy resources (e.g., number of wells, equipment to be used, specific locations of wells).

For the qualitative emission comparison approach, the following assumptions were used:

- All emission sources were assumed to operate at their reasonably foreseeable maximum emission rates (as identified in the other resource sections of this document) simultaneously throughout the area. Given the number of sources included in this analysis, the co-probability of such a scenario actually occurring over an entire year (or even 24 hours) is small.
- In developing the emissions inventory, there is uncertainty regarding ultimate development (e.g., number of wells, equipment to be used, specific locations). All proposed coalbed natural gas and conventional wells were assumed to be fully operational and to remain operating, except for normal well closures throughout the area (well numbers were provided by the BLM RMG Group).
- The emissions inventory uses peak years of construction and peak years of operation, which would not occur throughout the entire development region at the same time. However, it is possible that conditions close to this could occur in some isolated areas. Further, it is assumed that the maximum cumulative emissions will occur in the last year (2023) of the analysis.
- Mitigation measures are included in the emissions inventory that may not be achievable in all circumstances. However, actual mitigation actions decided on by the developers and local and

state authorities may be greater or less than those assumed in the analysis. For example, maintaining a construction road speed limit of 15 miles per hour (mph) might be reasonable in a construction zone but difficult to enforce elsewhere. Full (100 percent) mitigation of fugitive dust from disturbed lands might not be achievable. Further, although 50 percent reduction in fugitive emissions is assumed based on construction road wetting on the unimproved access road to the pad and at the pad, this level of effectiveness is characterized as the maximum possible. Wetting was assumed for maintenance traffic.

- Induced or secondary growth related to increases in vehicle miles traveled (VMT) is not included in the emissions inventory. Only activities directly related to BLM actions are considered.

The major assumptions used in developing the emissions calculations are as follows:

- Except for those emission factors that have been lowered through the WDEQ-AQD BACT requirements, EPA-recommended emission factors (AP-42) are appropriate for all activities
- The base year is 2003
- Activity factors (or the quantification of activity for each resource area as provided by the Rawlins Field Office) are appropriate for the base year and future time frames
- Any anticipated recreational growth would follow growth trends for Wyoming over the past 10 years
- For the qualitative analysis, only emissions from Rawlins Field Office BLM administered activities are included. (For the cumulative analysis, emissions calculated by TRC are included for other federal and nonfederal actions throughout the state.)
- Criteria pollutants and HAPs are included in the calculations
- Coal mining activity is 1.2 million tons per year production, and coal activity will cease in the year 2004
- No trona mining activity occurs on Rawlins Field Office BLM land.

Emissions were calculated for the following activities: coalbed natural gas (CBNG), coal mining, lands and realty, livestock grazing, off-highway vehicles (OHV), resource roads, salable minerals, vegetation, fire, and natural gas development. Activities related to weed control, wildlife and fisheries, and wild horses are assumed to be insignificant sources of air emissions.

A qualitative emission comparison approach was selected for this RMP air quality analysis. This approach was used because (1) sufficient specific data were not available on future projects, (2) there was limited time available to complete the analysis, (3) as projects are defined quantitative analysis will be required, and (4) WDEQ-AQD will require demonstration of compliance for any future specific projects. There are limitations associated with this approach. However, given the uncertainties concerning the number, nature, and specific location of future sources and activities, the emission comparison approach is defensible and provides a sound basis for comparing alternatives.

It is important to note that before actual development could occur, the applicable air quality regulatory agencies (including the state, tribe, or EPA) would review specific air pollutant emissions preconstruction permit applications that examine potential project-specific air quality impacts. As part of these permit reviews (depending on source size), the air quality regulatory agencies could require additional air quality impact analyses or mitigation measures. Thus, before development occurred, additional site-specific air

quality analyses would be performed to ensure protection of air quality. Federal land managers would require a demonstration that potential impacts from proposed projects would not adversely impact AQRV (including visibility) in sensitive Class I and Class II areas.

Emissions Calculations

Emissions for All Activities Except Fire

Summary emission inventories for each of the BLM activities for the base year short-term and long-term scenarios for all of the alternatives are found in Chapter 4.2, Air Quality Impact Assessment. These emissions were calculated from data provided by the Rawlins Field Office and used best available information, BACT, AP-42, and the emission studies from other BLM documents.

The numbers of oil and gas wells estimated are provided by the Rawlins Field Office and are shown in Table A4-4. (This table accounts for net wells in operation and subtracts wells that are abandoned.)

Table A4-4. Numbers of Oil and Gas Wells for the Rawlins Field Office

Well Type	Existing Wells Through 2003	2008 Operational Wells	2023 Operational Wells
No Action Alternative			
Coalbed Natural Gas (development)	62	943	3586
Coalbed Natural Gas (exploratory)	7	94	355
Total CBNG Wells	**69**	**1037**	**3941**
Natural Gas (development)	2439	3150	5285
Natural Gas (exploratory)	182	253	463
Total Conventional Gas Wells	**2621**	**3403**	**5748**
Total Combined Wells	**2690**	**4440**	**9689**
Alternative 2			
Coalbed Natural Gas (development)	62	989	3769
Coalbed Natural Gas (exploratory)	7	99	374
Total CBNG Wells	**69**	**1088**	**4143**
Natural Gas (development)	2439	3180	5404
Natural Gas (exploratory)	182	275	544
Total Conventional Gas Wells	**2621**	**3455**	**5948**
Total Combined Wells	**2690**	**4543**	**10091**
Alternative 3			
Coalbed Natural Gas (development)	62	758	2843
Coalbed Natural Gas (exploratory)	7	76	282
Total CBNG Wells	**69**	**834**	**3125**
Natural Gas (development)	2439	2952	4487
Natural Gas (exploratory)	182	251	464
Total Conventional Gas Wells	**2621**	**3203**	**4951**
Total Combined Wells	**2690**	**4037**	**8076**
Alternative 4			
Coalbed Natural Gas (development)	62	907	3474
Coalbed Natural Gas (exploratory)	7	108	416
Total CBNG Wells	**69**	**1015**	**3890**
Natural Gas (development)	2439	3127	5255
Natural Gas (exploratory)	182	251	470
Total Conventional Gas Wells	**2621**	**3378**	**5725**
Total Combined Wells	**2690**	**4393**	**9615**

Using the well numbers, individual tables of air emissions for all BLM activities were calculated in linked spreadsheets. These spreadsheets are available on an emissions CD.

Because oil and gas field activities consist of many phases (i.e., exploration, development, production, and closure), the components that need to be included in emission calculations are complex. To understand the elements and assumptions used in the emissions calculations in the emissions CD, the following summary is provided.

Table of Contents for Emissions CD

A list of the detailed spreadsheets, including a short description of some of the spreadsheets, is included below. (A brief description of the contents is included in the first several titles of natural gas development to provide a roadmap of the titles for the other resource areas.) In addition, a gas process flow diagram is included as a pdf file in the emissions CD.

Conventional Natural Gas—Exploratory, Development, and Operations

- Table ZZ—major oil and gas assumptions
- Assumptions—secondary level of assumptions
- Compressor Horsepower (HP) Estimates
- ng-pad const.-fug dust (conventional natural gas fugitive dust from construction)
- Well Field Gas Charac (well field gas characteristics)
- ng-pad const.-exh &flare-shrt (conventional natural gas construction traffic exhaust and flaring short term)
- ng-pad const.-exh &flare-long (conventional natural gas construction traffic exhaust and flaring long term)
- ng-commuting veh-fug dust-shrt (conventional natural gas fugitive dust from commuting vehicles short term)
- ng-commuting veh-fug dust-long
- ng-commuting veh-exhaust-shrt
- ng-commuting veh-exhaust-long
- ng-Operations-NG compress-shrt (natural gas operations compressors short term)
- ng-Operations-NG compress-long
- ng-Op NG Dehyd&Flash&Flare (VOC emissions natural gas operations dehydrators, flashing and flaring)
- ng-Ops-Dehyd&Sep-Heaters-shrt&long (natural gas operations dehydrator and separators heaters)
- ng-Ops-sta. vis-dust&exh-short (natural gas operation station visits vehicular emission short term)
- ng-Ops-sta. vis-dust&exh-long (natural gas operation station visits vehicular emission long term)
- ng-Ops-WO-dust&exh-short (natural gas well operations vehicle dust and exhaust short term)
- ng-Ops-WO-dust&exh-long2
- ng-Ops W&P vis-dust&exh-shrt (well and pipe station visits vehicular emissions)
- ng-Ops W&P vis-dust&exh-long
- ng-Road maint-dust&exh-shrt (road maintenance vehicular dust and exhaust short term)
- ng-Road maint-dust&exh-long
- ng-Comp maint-dust&exh-short (compressor maintenance vehicular dust and exhaust short term)
- ng-Comp maint-dust&exh-long
- Tanks-Condensate&Loadout (emissions from tanks and truck loadout)
- ng-summary-criteria-short (summary of all natural gas emissions short term)
- Annual Summary 2008

- Annual Summary 2023
- ng-summary-criteria-long
- (Same analysis and tabs for Base Year as above for 2003).

Coalbed Natural Gas—Exploratory, Development, and Operations

- Table ZZ—major oil and gas assumptions
- Assumptions—secondary level of assumptions
- Compressor Horsepower (HP) Estimates
- cbng-pad const.-fug dust
- cbng Well Field Gas Charac-(well field gas characterisitics)
- cbng-pad const. traffic-exh-shrt (Heavy equipment and traffic exhaust short term)
- cbng-pad const. traffic-exh-long
- cbng-commuting veh-fug dust-shrt
- cbng-commuting veh-fug dust-long
- cbng-commuting veh-exhaust-shrt
- cbng-commuting veh-exhaust-long
- cbng-operations-NG compress-shrt
- cbng-operations-NG compress-long
- cbng Dehyd shrt&long-(dehydrators short and long term emissions)
- cbng-Ops-Sep-shrt&long (coalbed natural gas operational separators)
- cbng-Ops-sta. visits-dust&exh-short
- cbng-Ops-sta. visits-dust&exh-long
- cbng-Ops-WO-dust&exh-short
- cbng-Ops-WO-dust&exh-long
- cbng-Ops W&P vis-dust&exh-shrt- (well and pipe visits fugitive and vehicular emissions)
- cbng-Ops W&P vis-dust&exh-long
- cbng-Road maint-dust&exh-shrt
- cbng-Road maint-dust&exh-long
- cbng-Compress maint-dust&exh-short
- cbng-Compress maint-dust&exh-long
- CBNG Water Reinjection (Coalbed Natural gas water reinjection pumps short and long)
- cbng-summary-criteria-short
- Annual NG Emissions 2008
- Annual NG Emissions 2023
- cbng-summary-criteria-long
- (same analyis and tabs for Base Year 2003 as above).

Coal Development

- Coal emissions

Lands and Realty

- L&R-heavyequip-dust-shrt&long
- L&R-heavyequip-exh-shrt&long
- L&R-Commuting-FugDust-short
- L&R-Commuting-FugDust-long
- L&R-Commuting-exhaust-short
- L&R-Commuting-exhaust-long
- Summary-short

- Summary-long.

Livestock Grazing

- LG-heavyequip-dust-shrt&long
- LG-heavyequip-exh-shrt&long
- LG-Commuting-FugDust-shortunpav
- LG-Commuting-FugDust-shortpaved
- LG-Commuting-FugDust-longunpav
- LG-Commuting-FugDust-longpaved
- LG-Commuting-exhaust-short
- LG-Commuting-exhaust-long
- Summary-short
- Summary-long.

Off-Highway Vehicles

- ATVs
- OH Motorcycles
- Snowmobiles
- OHV-Summary.

Resource Roads

- res road-dust&exh-short
- res road-dust&exh-long.

Salable Minerals

- sg-dry,hand,screen,load,etc.
- sg-unpaved roads
- sg-batchdrop
- heavy equipment-all operations
- gran-crush,screen,tx,etc
- gran-unpaved roads
- granite-batchdrop
- lime-crush,screen,tx,etc
- lime-unpaved roads
- limestone-batchdrop
- saleable-summary.

Vegetation

- Veg-heavyequip-dust-shrt&long
- Veg-heavyequip-exh-shrt&long
- Veg-Commuting-FugDust-short
- Veg-Commuting-FugDust-long
- Veg-Commuting-exhaust-short
- Veg-Commuting-exhaust-long
- Summary-short
- Summary-long.

The tables are linked spreadsheets with emissions calculations for short-term and long-term time frames. Each set of calculations for the non-oil and non-gas spreadsheets is cumulative, that is, the total emissions for all activities are cumulative for 5 and 20 years, respectively. The beginning of each spreadsheet identifies the emission factors and activity factors, in tabular format.

The detailed emissions tables identified above are on an emissions CD and are available by request from Susan Caplan.

Prescribed Fire Emissions Estimation

To estimate the total emissions of particulate matter and carbon monoxide from prescribed fires, the Simple Approach Smoke Estimation Model (SASEM) was used. SASEM is a simple screening-level Gaussian dispersion model designed to predict ground-level particulate matter impacts from a single source (fire) in generally flat terrain for the western United States.

When available, site-specific information provided by the Rawlins Field Office was used as input to the model. When such information was not available, either built-in model defaults or professional judgment was used to supply missing data.

A total of three scenarios were run according to the information provided by the Rawlins Field Office for Alternative 1. These are as follows:

- **Fire RFA**. Wildland/Urban Interface; five 20-acre treatments; total of 300 tons burned
- **Timber Harvest Residue**. Ten 10-acre burns, total of 160 tons burned
- **Vegetation RFA**. 4,000 acres per year of prescribed fire treatments.

It should be noted that the emission production module of SASEM was used only to estimate total emissions for each event as input to the qualitative air quality assessment. (See references in Chapter 4, Sestak and Riebau 1988.) The detailed results for these model runs are available from Susan Caplan (contact information provided above).

Rawlins RMPPA BLM Emissions

Tables A4-5 through A4-7 show summaries of total BLM emissions, estimated for the base year (2003), the short-term (2008), and the long-term (2023). The tables are broken down by activity and show emissions for the time frame referenced (i.e., base year, short-term, and long-term). Emissions are calculated on an annual basis (tons per year). In addition, for both the short-term and the long-term time frames (Tables A4-6 and A4-7, respectively), emissions were calculated for each alternative. (Because the base year is the same for all alternatives, only one set of base year emissions was needed.) These tables were used to generate the summary tables and figures presented in Chapter 4.

Table A4-5. Base Year (2003) Emissions Inventory for BLM-Administered Lands Within RMPPA (tons per year) Base Case

Activity	PM_{10} Tons	$PM_{2.5}$ Tons	NO_x Tons	SO2 Tons	CO Tons	VOC Tons	HAPs Tons [b]
Coalbed Natural Gas	137	27	125	5	99	52	8
Coal Mining	32	32 [a]	41	5	72	4	0
Lands and Realty	44	7	2	0	1	0	0
Livestock Grazing	52	8	3	0	3	1	0
OHV	4	4	2	0	256	135	14
Resource Roads	2	0	1	0	0	0	0
Salable Minerals	762	200	0	0	0	0	0
Vegetation	9	1	0	0	0	0	0
Fire	170	142	0	0	0	0	0
Subtotal: Other Activities	1120	401	47	5	330	139	14
Conventional Natural Gas	594	195	3,060	51	1,632	13,564	1,407
Total Base Year 2003	**1,851**	**623**	**3,232**	**61**	**2,061**	**13,755**	**1,429**

[a] $PM_{2.5}$ assumed = PM_{10} for this activity. Coal mining will cease after 2004

[b] HAP assumed = VOC × 0.1 for non-gas activities

Table A4-6. Short-Term (2008) Emissions Inventory for BLM-Administered Lands Within RMPPA (tons per year)

Activity	PM_{10} Tons	$PM_{2.5}$ Tons	NOx Tons	SO_2 Tons	CO Tons	VOC Tons	HAPs Tons [b]
Alternative 1 (No Action Alternative)							
Coalbed Natural Gas	536	137	1,313	24	1,406	791	120
Coal Mining	0	0 [a]	0	0	0	0	0
Lands and Realty	44	7	2	0	1	0	0
Livestock Grazing	52	8	3	0	3	1	0
OHV	7	7	3	0	574	209	21
Resource Roads	2	0.1	1	0.1	0.2	0.05	0
Salable Minerals	762	200	NA	NA	NA	NA	NA
Vegetation	64	10	2	0	3	1	0
Fire	170	142	0	0	0	0	0
Subtotal: Other Activities	1100	374	10	1	581	211	0
Conventional Natural Gas	734	247	4,137	65	2,148	17,584	1825
Total Short Term	**2,370**	**758**	**5,460**	**90**	**4,135**	**18,586**	**1,966**
Alternative 2							
Coalbed Natural Gas	564	144	1,382	26	1,480	833	126
Coal Mining	0	0 [a]	0	0	0	0	0

Activity	PM_{10} Tons	$PM_{2.5}$ Tons	NOx Tons	SO_2 Tons	CO Tons	VOC Tons	HAPs Tons
Lands and Realty	44	7	2	0	1	0	0
Livestock Grazing	52	8	3	0	3	1	0
OHV	7	7	3	0	574	209	21
Resource Roads	2	0	1	0	0	0	0
Salable Minerals	762	200	NA	NA	NA	NA	NA
Vegetation	64	10	2	0	3	1	0
Fire	170	142	0	0	0	0	0
Subtotal: Other Activities	1100	374	10	1	581	211	0
Conventional Natural Gas	763	256	4,280	67	2,206	18,080	1,876
Total Short Term	**2427**	**774**	**5672**	**94**	**4267**	**19,124**	**2,023**
Alternative 3							
Coalbed Natural Gas	424	109	1040	19	1112	626	95
Coal Mining	0	0 [a]	0	0	0	0	0
Lands and Realty	44	7	2	0	1	0	0
Livestock Grazing	52	8	3	0	3	1	0
OHV	7	7	3	0	574	209	21
Resource Roads	2	0	1	0	0	0	0
Salable Minerals	762	200	NA	NA	NA	NA	NA
Vegetation	64	10	2	0	3	1	0
Fire	170	142	0	0	0	0	0
Subtotal: Other Activities	1100	374	10	1	581	211	0
Conventional Natural Gas	616	213	3596	54	1933	14,871	1549
Total Short Term	**2140**	**696**	**4646**	**74**	**3626**	**15,708**	**1665**
Alternative 4							
Coalbed Natural Gas	530	136	1,298	24	1,391	783	118
Coal Mining	0	0 [a]	0	0	0	0	0
Lands and Realty	44	7	2	0	1	0	0
Livestock Grazing	52	8	3	0	3	1	0
OHV	7	7	3	0	574	209	21
Resource Roads	2	0	1	0	0	0	0
Salable Minerals	762	200	NA	NA	NA	NA	NA
Vegetation	64	10	2	0	3	1	0
Fire	170	142	0	0	0	0	0
Subtotal: Other Activities	1100	374	10	1	581	211	0
Conventional Natural Gas	632	222	3,747	55	2,038	17,357	1,802
Total Short Term	**2,262**	**732**	**5,055**	**80**	**4,010**	**18,351**	**1,941**

a $PM_{2.5}$ assumed = PM_{10} for this activity. Coal mining will cease after 2004

b HAP assumed = VOC × 0.1 for non-gas activities

Table A4-7. Long-Term (2023) Emissions Inventory for BLM-Administered Lands Within RMPPA (tons per year)

Activity	PM_{10} Tons	$PM_{2.5}$ Tons	NOx Tons	SO2 Tons	CO Tons	VOC Tons	HAPs Tons [b]
Alternative 1 (No Action Alternative)							
Coalbed Natural Gas	877	324	4,648	47	5,427	3,084	470
Coal Mining	0	0 [a]	0	0	0	0	0
Lands and Realty	61	9	4	0	2	1	0
Livestock Grazing	47	7	3	0	3	1	0
OHV	11	11	5	0	889	326	33
Resource Roads	2	0.1	1	0.12	0.2	0.05	0
Salable Minerals	762	200	NA	NA	NA	NA	NA
Vegetation	64	10	2	0	3	1	0
Fire	170	142	0	0	0	0	0
Subtotal: Other Activities	1117	378	14	1	898	329	33
Conventional Natural Gas	904	318	5,502	77	3,169	17,451	1,847
Total Long Term	**2,898**	**1,020**	**10,164**	**125**	**9,494**	**20,864**	**2,350**
Alternative 2							
Coalbed Natural Gas	922	341	4,892	49	5,712	3,246	495
Coal Mining	0	0 [a]	0	0	0	0	0
Lands and Realty	61	9	4	0	2	1	1
Livestock Grazing	47	7	3	0	3	1	0
OHV	11	11	5	0	889	326	33
Resource Roads	2	0	1	0	0	0	0
Salable Minerals	762	200	NA	NA	NA	NA	NA
Vegetation	64	10	2	0	3	1	0
Fire	170	142	0	0	0	0	0
Subtotal: Other Activities	1117	378	14	1	898	329	34
Conventional Natural Gas	944	333	5,759	80	3,307	19,028	2009
Total Long Term	**2,983**	**1,052**	**10,665**	**130**	**9,917**	**22,603**	**2538**
Alternative 3							
Coalbed Natural Gas	692	256	3,672	37	4,287	2,438	371
Coal Mining	0	0 [a]	0	0	0	0	0
Lands and Realty	61	9	4	0	2	1	0
Livestock Grazing	47	7	3	0	3	1	0
OHV	11	11	5	0	889	326	33
Resource Roads	2	0	1	0	0	0	0
Salable Minerals	762	200	NA	NA	NA	NA	NA
Vegetation	64	10	2	0	3	1	0
Fire	170	142	0	0	0	0	0
Subtotal: Other Activities	1117	378	14	1	898	329	33
Conventional Natural Gas	741	264	4,592	63	2,682	13,719	1,459

Activity	PM_{10} Tons	$PM_{2.5}$ Tons	NOx Tons	SO2 Tons	CO Tons	VOC Tons	HAPs Tons
Total Long Term	**2,550**	**898**	**8,278**	**101**	**7,867**	**16,486**	**1,863**
Alternative 4							
Coalbed Natural Gas	867	320	4,602	46	5,374	3,054	466
Coal Mining	0	0 [a]	0	0	0	0	0
Lands and Realty	61	9	4	0	2	1	0
Livestock Grazing	47	7	3	0	3	1	0
OHV	11	11	5	0	889	326	33
Resource Roads	2	0	1	0	0	0	0
Salable Minerals	762	200	NA	NA	NA	NA	NA
Vegetation	64	10	2	0	3	1	0
Fire	170	142	0	0	0	0	0
Subtotal: Other Activities	1117	378	14	1	898	329	33
Conventional Natural Gas	801	293	5,116	67	3,062	16,957	1,797
Total Long Term	**2,785**	**991**	**9,732**	**114**	**9,334**	**20,340**	**2,296**

[a] $PM_{2.5}$ assumed = PM_{10} for this activity. Coal mining will cease after 2004
[b] HAP assumed = VOC × 0.1 for non-gas activities

RESULTS OF IMPACT ANALYSIS

Table A4-8 summarizes the existing conditions described in Chapter 3, Affected Environmental (Air Quality).

Table A4-8. Existing Conditions

Air Quality Value Air Pollutant Concentrations	
Criteria Air Pollutants	**Concentrations** Base year: in compliance with NAAQS and WAAQS
Visibility (Rocky Mountain National Park [RMNP] and Centennial)	
Visual Range	**20% cleanest**: Base year 150–173 miles (RMNP) and 178 (Centennial 2001) **Average:** Base year 112–126 miles (RMNP) and 117 (Centennial 2001) **20% haziest:** Base year 71–88 miles (RMNP) and 81 Centennial 2001) **Visibility Guidelines** Base year: Within guidelines
Atmospheric Deposition (Centennial, Wyoming)	
Precipitation pH	Base year: 4.9–5.2
Total Deposition	**Total nitrogen deposition**[a] Base year: 4.3 kg/ha/year **Total sulfur deposition**[b] Base year: 2.5 kg/ha/year **Total nitrogen deposition guidelines** Base year: Not within guidelines 1999: otherwise, within **Total sulfur deposition guidelines** Base year: Within guidelines

Air Quality Value
Air Pollutant Concentrations

[a] Proposed acceptable total annual loading nitrogen deposition is 3 to 5 kg/ha/year (USFS 1989)

[b] Proposed acceptable total annual loading sulfur deposition is 5 kg/ha/year (USFS 1989)

The emission inventory results and qualitative impacts for the alternatives are included in Chapter 4.2, Air Quality Assessment, and total emissions are shown in Table A4-9. Table A4-10 shows the increases in emissions from alternative to alternative, and year to year.

Table A4-9. Total Emissions for Alternatives (tons per year)

Alternative	2003	2008	2023
Alternative 1 (No Action Alternative)	20,960	30,641	43,545
Alternative 2	20,960	31,585	46,298
Alternative 3	20,960	26,194	35,282
Alternative 4	20,960	29,758	42,305

Note: Totals are all pollutants minus $PM_{2.5}$ and HAPs

Table A4-10. Increase in Annual Air Emissions from Base Year Conditions on BLM-Administered Lands Within the RMPPA[a]

Time Frame	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOC	HAP
Alternative 1 (No Action Alternative)							
2008	519 (28%)	135 (22%)	2,228 (69%)	29 (48%)	2,074 (101%)	4,831 (35%)	537 (38%)
2023	1,047 (57%)	397 (64%)	6,932 (214%)	64 (105%)	7,433 (361%)	7,109 (52%)	921 (64%)
Alternative 2							
2008	576 (31%)	151 (24%)	2,440 (76%)	33 (54%)	2,206 (107%)	5,369 (39%)	594 (42%)
2023	1,132 (61%)	429 (69%)	7,433 (230%)	69 (113%)	7,856 (381%)	8,848 (64%)	1,109 (78%)
Alternative 3							
2008	289 (16%)	73 (12%)	1414 (44%)	13 (21%)	1,575 (76%)	1953 (14%)	236 (17%)
2023	699 (38%)	275 (44%)	5,046 (156%)	40 (66%)	5,806 (282%)	2431 (20%)	434 (30%)
Alternative 4							
2008	411 (22%)	109 (17%)	1,823 (56%)	19 (31%)	1,949 (95%)	4,596 (33%)	512 (36%)
2023	934 (50%)	368 (59%)	6,500 (201%)	53 (87%)	7,273 (353%)	6,585 (48%)	867 (61%)

[a] Constituents increase in tons per year and (in percentage change from base year emissions)

Other Emissions Data

Although only BLM activities were included in the qualitative analysis, other emissions data are being developed for areas that include the Rawlins District. These data were provided by TRC Environmental Corp (TRC, 2004), using State of Wyoming air permit information and other information, including all potential (PTE) and some actual emissions for point sources throughout Wyoming that were permitted between January 1, 2001, and June 30, 2003. Tables A4-11 and A4-12 show the calculations of the

incremental increase (i.e., change from the base year) in emissions from January 1, 2001 (the base year), through June 30, 2003, for permitted sources.

The Wyoming statewide emission inventory conducted by TRC indicates that there will be a change in future emissions of NO_x, SO_2, PM_{10}, and $PM_{2.5}$ in the RMPPA and for the State of Wyoming. This study uses different base year dates. The Wyoming statewide complete emissions increases (or decreases) were calculated (1) from all permitted sources, from January 1, 2001, through June 30, 2003; (2) all new oil and gas commission sources from 2002; and (3) all NEPA authorized and other quantifiable emissions from June 30, 2003. (This last case is referred to as the Wyoming statewide Reasonable Forseable Development [RFD]). It should be noted that not all emissions permitted or authorized during this period are occurring yet.

The RFD case refers only to oil and gas projects and covers the change in emissions after June 30, 2003, for authorized NEPA and other quantifiable emissions. (Specifically, the RFD case is defined by TRC as "...1) the NEPA-authorized but not yet developed portions of the Wyoming NEPA projects and 2) not yet authorized NEPA projects for which air quality analyses were in progress and for which emissions had been quantified.)" Also, complete (total) emissions are calculated. Table A4-12 shows these emissions. It is expected that these data will someday be integrated with the BLM emissions data to depict all emissions in the Rawlins District and can be used for cumulative analysis. Also, this information will be needed if air dispersion modeling is performed in the area.

Table A4-11. Incremental Emissions From Permitted Sources, January 2001 through June 2003, for the RMPPA

	WDEQ-AQD Permitted Sources				WOGCC Permitted Oil and Gas Wells[a]			
	Change In Emissions (tpy)				Change In Emissions (tpy)			
Area	NO_x	SO_2	PM_{10}	$PM_{2.5}$	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Rawlins FO[b]	281	(1,002)	(49)	(49)	9.5	--	--	--
Wyoming	20,344	(85)	(1,812)	(1,539)	150.9	--	--	--

[a] Emission factors per well were assumed according to the following: 0.045 tons per year (tpy) of NO_x per producing natural gas or coalbed natural gas well, equivalent to well emission rates calculated for the Jonah Infill Project, 2004, and 0.3 tpy NO_x per producing oil well (obtained from Denise Kohtala, WDEQ-AQD).
[b] Permitted oil and gas wells category includes Carbon, Albany, and Laramie counties.

Table A4-12. RFD and Complete Emissions for the RMPPA[a]

	RFD[b]				Complete Inventory			
	Change In Emissions (tpy)				Change In Emissions (tpy)			
Area	NO_x	SO_2	PM_{10}	$PM_{2.5}$	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Rawlins FO[c]	1,147	0	6.8	6.8	1,438	(1,002)	(43)	(43)
Wyoming	6,016	115	741	195	26,510	30	(1,072)	(1,343)

[a] Emission factors per well were assumed according to the following: 0.045 tpy of NO_x per producing natural gas or coalbed natural gas well, equivalent to well emission rates calculated for the Jonah Infill Project, 2004, and 0.3 tpy NO_x per producing oil well, obtained from Denise Kohtala, WDEQ-AQD.
[b] RFD defined as authorized NEPA projects and NEPA projects not yet authorized but for which air emissions have been quantified.
[c] Permitted oil and gas wells category includes Carbon, Albany, and Laramie counties.

The data in Table A4-11 indicate that permitted sources from January 1, 2001, through June 30, 2003, have contributed additional NO_x emissions of 281 tons per year and that emissions of other pollutants were reduced for the RMPPA. However, because the base year for the emissions calculations for the

Rawlins RMPPA is for 2003, the RFD values in Table A4-12 are more appropriate for comparison of cumulative impact. In Table A4-12, the RFD NO_x emissions for the Rawlins Field Office are about one-half the NO_x calculated for the RMP (see Table A4-10) for the short term and about one-sixth of the emission differences projected for the long term (see tables above for comparisons). The RFD values for the State of Wyoming are a little less than long-term BLM RMP emissions, except for particulates. (This is to be expected because much of the BLM RMP particulate emissions sources, such as construction activities, do not require a permit.)

CONCLUSIONS AND RECOMMENDATIONS

A qualitative emission comparison approach was selected for analysis of impacts on air quality. This approach was used because (1) sufficient specific data were not available on future projects, (2) there was limited time available to complete the analysis, (3) quantitative analysis will be required as development projects are defined in the future, and (4) WDEQ-AQD will require demonstration of compliance with federal and state air quality regulations and standards for any future development projects. Given the uncertainties regarding the number, nature, and specific location of future emission sources and activities, the emission comparison approach is defensible and provides a sound basis for comparing the potential impacts under the various alternatives. Federal land managers will require a demonstration that potential impacts from proposed projects will not adversely impact AQRV (including visibility) in sensitive Class I and Class II areas.

For the RMP-specific air quality analysis, the BLM concludes the following:

Under Alternative 1, emissions have been calculated for the base year and for 5-year and 20-year time horizons. These will serve as the basis for comparisons of alternatives. Information in Tables A4-7 through A4-9 indicates that the total emissions of criteria pollutants increase from 20,960 tons per year in the base year (2003) to 43,545 tons per year by 2023. Most of the increase is due to oil and gas exploration and development. Alternative 2 produces higher emissions than Alternative 1 (emissions of 46,298 ton per year in 2023), and Alternative 3 produces lower emissions estimates for 2023 (35,282 tons per year). Alternative 4 produces emission levels between those of Alternatives 2 and 3 (42,305 tons per year).

Given the low ambient concentrations that exist in the Rawlins area for all of the pollutants except ozone, it is expected that the increase in emissions, under any alternative, of carbon monoxide (CO), nitrogen oxides (NO_2), sulfur dioxide (SO_2), PM_{10}, and $PM_{2.5}$ will not cause any exceedance of state or federal ambient air quality standards. Because a quantitative relationship between the expected air emissions calculated above and the subsequent potential impacts on ambient criteria pollutant concentrations, visibility, atmospheric deposition, or ozone are not known, it is not possible to draw any conclusions as to potential expected impacts on these air quality values from any alternative. BLM intends to make quantitative estimates of these impacts for project-specific EISs and in the statewide air quality analysis.

For the cumulative analysis, BLM concludes the following:

Given the low ambient concentrations that exist in the Rawlins RMPPA for criteria pollutants except ozone, it is expected that the cumulative increase in emissions for all of sources in the region of influence (ROI) of carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), PM_{10}, and $PM_{2.5}$ would not cause any exceedance of state or federal ambient air quality standards.

Because a quantitative relationship between the expected air emissions calculated above and the subsequent potential cumulative impacts on the air quality values of visibility, atmospheric deposition, or ozone are not known, it is not possible to quantify potential impacts on these air quality values from the

sources in the ROI. However, because air quality analyses from recent energy development projects, such as the Desolation Flats project (BLM 2003), estimate potential impacts on visibility, the possibility that the emissions described in Section 4.2 may contribute to significant impacts on visibility must be considered. Results of a quantitative analysis using modeling performed for the Desolation Flats EIS suggest that RMPPA activities could contribute to a significant impact on visibility in the Bridger, Fitzpatrick, Mount Zirkel, and Rawah WAs.

In addition to these findings, monitoring of total nitrogen deposition in the Snowy Range shows deposition loading above the Forest Service LOC. Accordingly, emissions described in Section 4.2 may contribute to significant impacts on total nitrogen deposition. BLM intends to make quantitative estimates of these impacts for project-specific EISs and in the statewide air quality analysis.

Given the qualitative nature of the emission comparison approach, it is recommended that the following actions be performed:

- A more sophisticated air quality set of tools should be considered for future analysis of specific projects (i.e., modeling)
- Additional monitoring for ambient criteria pollutants, visibility, and atmospheric deposition should be conducted in the area.
- Mitigation measures, such as those discussed in this AQTSD, should be considered. Some of these measures include dust suppression and control during construction, electric power generation for natural gas compressor engines, flareless completion, and natural gas compressor engine nitrogen oxide controls.

INTERNET RESOURCES

Numerous Internet resources were accessed to develop the data used in this document. Key information concerning emission factors and emissions was obtained from EPA Web sites.

Climate

Western Regional Climate Center:http://www.wrcc.sage.dri.edu/climsum.html/

NOAA: http://www.noaa.gov

Stagnation Index: http://www.ncdc.noaa.gov/oa/climate/research/stagnation/stagnation.html

Air Quality: Emissions

EPA: http://www.epa.gov/ttn/chief/ap42

Air Quality: Concentrations

EPA: http://www.epa.gov/air/data/geosel.html

CASTNet: EPA: http://www.epa.gov/castnet

NPS: http://www2.nature.nps.gov/ard/gas/airatlas-du/viewer_index.htm

BLM: http://www.blm.gov

BLM: http://www.wy.blm.gov

Air Quality: Atmospheric Deposition

NADP: http://nadp.sws.uiuc.edu/

CASTNet: EPA: http://www.epa.gov/castnet

NPS: http://www2.nature.nps.gov/ard/gas/airatlas-du/viewer_index.htm

Air Quality: Visibility

IMPROVE: http://vista.cira.colostate.edu/improve

IMPROVE: http://vista.cira.colostate.edu/views

FLAG: http://www.WDEQ-AQD.nps.gov/ard/flagfree

Wyoming Visibility Monitoring Network: http://www.wyvisnet.com

MITIGATION OPTIONS

Mitigation may be applied to fugitive dust and NO_x impacts. Fugitive dust refers to any particulate matter that is not deliberately emitted by a well-defined source. Fugitive dust sources typically include windblown dust from unvegetated lands, construction, and unpaved roads. Table A4-13 shows several available fugitive dust mitigation options.

Table A4-13. Fugitive Dust Mitigation Measures (PM_{10}), Effectiveness and Cost

	Dust Sources					
	Disturbed Areas	Unpaved Roads [a,b,c]				
Effectiveness	Level proportional to percentage of land cover	0 to 50% reduction in uncontrolled dust emissions	33% to 100% control efficiency	80% for 15 mph[c] 65% for 20 mph[c] 25% for 30 mph[c]	30% reduction	90% reduction
Estimated Cost	Unknown	$4,000/mile	$2,000 to $4,000/mile per year	Unknown	$9,000/ mile	$11,000 to $60,000/mile

[a]Improved and county roads
[b]Wetting of construction roads during the construction period. Wetting of construction roads not required for once-a-month maintenance trips to well pads.
[c]Reductions assume a 40-mile-per-hour base speed.

Nitrogen oxide emissions are associated with combustion. Table A4-14 shows several potential mitigation measures that could reduce impacts from NO_x emissions. The appropriate level of control will be determined by the WDEQ-AQD during the construction permit process.

Table A4-14. Nitrogen Oxides (NO_x) Mitigation Measures Efficiency

	NO_x Emissions Sources			
	Field Compressors	Sales Compressors	Temporary Diesel Generators[a]	Heavy Equipment
Mitigation Options/Efficiency	Implement Best Available Control Technology Typically results in a NO_x emission rate of about 1 g/bhp-hr	Implement Best Available Control Technology Typically results in a NO_x emission rate of about 1 g/bhp-hr	Register with State; WDEQ regulate as appropriate	Voluntary use of electric engines[b]

[a]Wyoming is currently registering these generators to determine whether NO_x emissions are significant.
[b]BACT could include electric compression.

In addition, Table A4-15 shows additional mitigation measures to be considered in the Rawlins impact assessment. These are general mitigation opportunities that should be considered and applied as appropriate. BLM has no authority to require any application of these measures, although industry is encouraged to implement these measures on its own before it is required to by WDEQ. Advances in technology are likely to offer new mitigation options during the time covered by the RMP. Under NEPA, the planners of individual projects in the RMPPA must recommend mitigation measures that are appropriate for the projects. The Wyoming DEQ, as the permitting authority, will review permit applications and require specific emission control devices and measures. All costs shown in Table A4-15 are approximate.

Table A4-15. Additional Mitigation Measures With Approximate Costs and Benefits

Type of Mitigation	Approximate Cost	Environmental Cost	Potential Limitations	Environmental Benefit
Selective Catalytic Reduction for Compressor Emissions	$4,000 to $27,000 per NO_x ton-year	Possible NH_3 releases	Cost may be prohibitive for oil and gas applications	NO_x emission rate reduced to 0.1 g/hp-hr; decreased visibility impact
"Green Completions" and Flowback Units	Capital cost ranges from $1,000 to $10,000. Operating cost is $1,000/year. Payback 1–3 years	Moving equipment to and from well completions; fugitive dust from truck		Saves 100,000 cubic feet of gas per well per year; reduces flaring emissions by 70% to 90% at completion
Condenser on Glycol Dehydrator	$1,000 to $10,000	Unknown		1% to 10% VOC reduction
Activated Carbon Filter on Condensate Storage Tank	$1,000 and up	Energy required to recycle filter		50% to 80% VOC reduction

Type of Mitigation	Approximate Cost	Environmental Cost	Potential Limitations	Environmental Benefit
Electrical Compressors	Capital cost is 40% of gas turbine cost. Operating costs depend on location of transmission lines	Displaced air emissions from compressor unit to electric power plant		Moving air emissions away from sensitive Class I areas
Fugitive Dust Road Treatment	$2,400 to $50,000 per mile	Possible vegetation effects		20% to 100% dust control
Fugitive Dust Administrative Control	$13,000 per well for remote telemetry. A few added work hours per year traveling at enforced speed limits	Minor/unknown	Hard to enforce	Reduced VMTs with related emission reductions. Slower speeds give 20% to 50% reductions in dust emissions
Larger Diameter Sales Pipeline	Capital costs increase with larger pipes. Operating costs decrease with larger pipes	Larger trench for burying line. Slightly more surface disturbance	Probably applicable only for large producing operations	Lower gas pressures with resulting lower compressor emissions
Microhole drilling	Cost of technology transfer, then potentially less than conventional drilling	Additional impacts if duplicate drilling is necessary		Lighter equipment on roads, smaller drilling sites, reduced gaseous emissions during drilling
Condensate Pipelines	Cost of pipe and installation minus cost of eliminated storage tank and trucking	Trench for burying line	Cost may outweigh benefit	Reduce emissions from storage vessels; reduce miles traveled by vacuum trucks
Stage I Vapor Controls for Condensate Transfer for Truck Loading	$1,000 to $3,000	Potential fire risk with improper operation		90% VOC emission reduction during transfer
Wind Farm Electric Generation	4 to 5 cents/kW-hr. Capital costs are large	Visual impacts, impacts on raptors, maintenance	Large capital costs required	Reduced power plant emissions. (VOC, NO_x, SO_2, CO, CO_2)
Phased Oil and Gas Development	Short-term loss of state and federal royalties	Emissions averaged over a longer period		Peak emissions and impacts are reduced

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TRC, 2004. Regional Air Emissions Inventory Methodology Summary. Prepared for Booz Allen Hamilton, United States Department of Interior Bureau of Land Management Wyoming State Office, Rawlins Field Office, and Pinedale Field Office. TRC Environmental Corporation, 605 Skyline Drive, Laramie, Wyoming. April, 2004.

U.S. Department of the Interior. BLM Rawlins and Rock Springs Field Offices. 1993. *Draft Environmental Impact Statement Desolation Flats Natural Gas Field Development Project.* April.

U.S. Environmental Protection Agency (EPA), Office of Pollution Prevention and Toxics. 1993. *Status Report on the Use of Environmental Labels Worldwide,* Washington, DC. EPA 741-R-0-93-001

APPENDIX 5—CULTURAL RESOURCES MANAGEMENT

PROGRAM OBJECTIVES

The Bureau of Land Management (BLM) has developed a cultural resources program designed to inventory, evaluate, and manage cultural resources on BLM-administered public land and in areas of BLM responsibility. BLM management of cultural resources (archaeological, historic, and socio-cultural properties) is in accordance with the provisions of the National Historic Preservation Act (NHPA) of 1966, as amended, and other applicable legislation.

IDENTIFICATION OF CULTURAL RESOURCES

BLM requires cultural resource inventories for actions with federal responsibility that include surface disturbance as a part of the action. Three classes of inventory have been established; Class III is the most intensive.

Class I inventories are completed using existing data from cultural resource inventory files maintained by both BLM and the Wyoming State Historic Preservation Office (SHPO). Class I inventories are conducted at two different levels: at the planning stage of an Environmental Impact Statement (EIS) to produce a regional overview and at the site-specific level for individual proposed projects to determine whether previous cultural resource inventories have been conducted within the Area of Potential Effects (APE). The purpose of class I inventories is to provide cultural resource specialists and managers with an informed basis for understanding the nature of the archaeological record within the area in question.

Class II inventories are statistically based sample surveys designed to aid in characterizing the probable density, diversity, and distribution of cultural properties in the area, to develop and test predictive models, and to answer appropriate research questions. Within individual sample units, survey aims, methods, and intensity are the same as those applied in a Class III survey. Class II surveys may be conducted in several phases that use different sample designs to improve statistical reliability.

Class III intensive field surveys are conducted by professionals thorough pedestrian survey of an entire target area. The intent of a Class III inventory is to locate and record all historic properties in a manner consistent with standards in the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 CFR 44716). Class III inventories conform to the prevailing professional survey standards for the region involved, provided that the regional standards meet or exceed the Secretary's Standards and Guidelines. Because a Class III survey is designed to produce a total inventory of the cultural properties observable within the target area, once it has been completed, no further survey work should be needed in the target area as long as the current standards have been met. Areas with a high probability of containing buried cultural materials or that are known to contain cultural materials may require additional professional monitoring and/or data recovery excavations. Areas that require additional work are analyzed on a case-by-case basis, depending on the proposed action and the types of cultural resources present in the project area.

BLM Jurisdiction on Privately Owned and/or Split Estate Lands

Class III inventories are generally required before surface-disturbing actions are authorized on publicly owned surface lands and/or on private or state owned surface lands if the proposed project could not occur without the use of federally owned lands or if the project would require a BLM permit, license, or approval. If a project requires the use of federally owned surface lands as well as privately owned surface lands, two authorities require federal agencies to apply the same NHPA Section 106 compliance standards to private lands as they do to federal lands. The regulations at 36 CFR, Part 800.4(b) require the federal agency to "take the steps necessary to identify historic properties within the area of potential effect." That this regulation covers both federal and nonfederal lands is implicit throughout the statute and the regulations because the regulatory definition of "area of potential effect is "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties" [36 CFR, Part 800.16(d)]. It makes no distinction between federal and nonfederal lands. More explicit, however, is Executive Order (EO) No. 11593, entitled "Protection and Enhancement of the Cultural Environment." Under the EO, Section 1(3), it states that all federal agencies: "...in consultation with the Advisory Council on Historic Preservation, institute procedures to assure that federal plans and programs contribute to the preservation and enhancement of nonfederally owned sites, structures and objects of historical, architectural, or archaeological significance."

Split estate lands are defined as those lands where surface ownership transferred to private landowners from the Federal Government but the Federal Government retained the mineral rights. These situations arose either through patent under the 1914 amendment to the Homestead Act or purchase under the Stock-raising Act of 1916. Each of these Acts also allowed for the Federal Government to "reenter and occupy so much of the surface...as may be required for all purposes reasonably incident to the mining or removal of coal or other minerals." At the time of purchase, the buyer agreed to these terms. Because completing the NHPA Section 106 process is required of a federal agency by statute and regulation prior to the federal action, then completion of that process is a purpose reasonably incident to the extraction of the minerals.

Evaluation of Cultural Resource Sites

BLM evaluates the significance of cultural resources identified during inventory in consultation with the Wyoming SHPO to determine whether the resources are eligible for inclusion in the National Register of Historic Places (NRHP). Cultural resource properties may be considered eligible for listing on the National Register if they meet one or more of the following criteria identified in 36 CFR 60.4:

- **Criterion A:** An historic property is associated with an event or events that have made a significant contribution to the broad patterns of America's history.
- **Criterion B:** An historic property is associated with the lives of persons significant to our past.
- **Criterion C:** An historic property embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic value, or represents a significant and distinguishable entity whose components may lack individual distinction.
- **Criterion D:** An historic property has yielded or may be likely to yield information important in prehistory or history.

To facilitate evaluation of cultural resource values in Wyoming, BLM has devised guidelines for determining the eligibility of archaeological and historical sites and historic trails (BLM Manual 8110.32). The guidelines supplement the National Register criteria for evaluation (36 CFR 60.4) and provide consistency across the state. Application of the guidelines ensures that significant cultural resources are recognized and managed accordingly.

Properties that encompass large areas can be deemed to have contributing and non-contributing portions. Contributing portions are seen to retain integrity of the values for which the property is considered eligible for the NRHP. Non-contributing portions are identified portions of the property that are not deemed to retain the integrity of values that would render the property eligible for the NRHP. The determination of contributing versus non-contributing portions of an eligible property can be made at any time after adequate evaluation has been conducted.

Historic trails, including the Overland and Cherokee, the Rawlins to Fort Washakie Freight Road, and the Rawlins to Baggs Freight Road, are considered eligible for the National Register under Criterion A. However, some portions of the trails no longer retain the aspects of integrity necessary for eligibility. Because no encompassing inventories of entire trails within the Rawlins Resource Management Plan Planning Area (RMPPA) have been conducted, portions of trails are evaluated to determine whether they contribute to the eligibility of the property on a case-by-case basis. Trail segments are evaluated pursuant to the National Register criteria of integrity (location, design, setting, materials, workmanship, feeling, and association). If most of the criteria are met, the segment will be considered to contribute to the property's overall NRHP eligibility.

After determination of eligibility, significant cultural resource properties are further evaluated for assignment to one or more use categories. BLM has established six use categories as follows:

1. **Scientific Use.** This category applies to any cultural property determined to be available for scientific or historical study using currently available research techniques, including methods that would result in the property's physical alteration or destruction. Recommendations to allocate individual properties to this use must be based on documentation of the kinds of data the property is thought to contain and the data's importance for pursuing specified research topics.

2. **Conservation for Future Use.** A cultural property included in this category is deemed worthy of segregation from all other land or resource uses, including cultural resource uses, that threaten the maintenance of its present condition or setting, and that property will remain in this use category until specified provisions are met in the future.

3. **Traditional Use.** This category is to be applied to any cultural resource known to be perceived by a specified social and/or cultural group as important in maintaining the cultural identity, heritage, or well being of the group. Cultural properties assigned to this category are to be managed in ways that recognize the importance ascribed to them and that seek to accommodate their continuing traditional use.

4. **Public Use.** This category may be applied to a cultural property found to be appropriate for use as an interpretive exhibit in place or for related educational and recreational uses by members of the general public.

5. **Experimental Use.** This category may be applied to a cultural property judged well-suited for controlled experimental study, to be conducted by BLM or others, concerned with the techniques of managing cultural properties, that would result in the property's alteration, possibly including loss of integrity and destruction of physical elements. It should not be applied to cultural

properties with strong research potential, traditional cultural importance, or good public use potential, if such designation would significantly diminish those uses.

6. **Discharged from Management.** This category is assigned to cultural properties that have no remaining, identifiable use. Most often these are prehistoric and historic archaeological properties, such as small surface scatters of artifacts or debris, whose limited research potential is effectively exhausted as soon as they have been documented. Properties discharged from management remain in the inventory, but they are removed from further management attention and do not constrain other land uses.

When a cultural resource property is assigned to one or more use categories, a decision is made pertaining to the management of that property. The criteria and guidelines for the evaluation of cultural resources and the assignment of significant cultural resource properties to specific use categories would remain unchanged under all the alternatives addressed in this plan.

According to the Protocol Agreement between the Wyoming BLM and the Wyoming SHPO, BLM is required to consult with the SHPO on eligibility and effects to each cultural property. Those sites recommended as eligible under Criteria A, B, or C requires case-by-case consultation with the Wyoming SHPO. Under the Protocol Agreement between the Wyoming BLM and the Wyoming SHPO, the Wyoming BLM has the implied concurrence of Wyoming SHPO in determining eligibility and effects for sites under Criterion D of the NHPA. Determination of effects to sites follows the criteria outlined in 36 CFR 800.5.

In addition to consultation with the Wyoming SHPO office, BLM conducts Native American consultation in compliance with Section 106 of the NHPA, the American Indian Religious Freedom Act of 1978, and EO No. 13007. Consultations with Native American tribes occur during the planning process of EISs and when individual projects are proposed that may impact properties that have traditional use (i.e., Traditional Cultural Properties [TCP]) or are sacred to Native American cultures. The consultation process includes requesting information pertaining to the nature of the site and asking for concurrence on the effects of the project on sites.

MANAGEMENT OF CULTURAL RESOURCES

Management objectives for significant cultural resource values provide a direct link between the assignment of properties to use categories and the achievement of the cultural resource program objectives. The basic management objectives for significant cultural resource values would remain unchanged under all of the alternatives addressed in this plan.

Specific management actions that could be taken to achieve these objectives at selected significant properties are described in the discussions of the various alternatives. Management objectives for significant properties that have not yet been identified or for which inventory data are insufficient as of this writing will remain unchanged, but management actions for these properties will be prescribed on a case-by-case basis and will be addressed in amendments to this plan when appropriate.

Standard Protective Measures

Description

Within the framework described above, BLM has developed protective measures to minimize adverse effects (as defined in 36 CFR 800.5[1]) on significant cultural resource values. Protective measures are used in response to the proposed actions of BLM programs involving surface disturbance. These

measures include cultural resource inventories, evaluation of cultural resources located during inventory, and mitigation of potential adverse impacts on significant cultural resources. Mitigation measures are determined based on the types of proposed actions and the nature of the historic property. Mitigation may include avoidance, data recovery, or the presence of a BLM-authorized archaeologist during surface-disturbing activities. Avoidance, through modification of the proposed undertaking, is the primary and preferred mitigative measure used to protect cultural resources. For properties where the visual integrity contributes to NRHP eligibility, additional mitigative measures are undertaken to ensure no adverse effects occur. When a proposed project is found to be within the viewshed of an historic property that contributes to NRHP eligibility, an assessment of potential impacts is conducted through viewshed analyses, on-site inspection, and photo inspection. Mitigation measures used to ensure that the contributing viewshed of historic properties are not adversely affected include, but are not limited to, decreasing the height of structures, using paint and topography to blend structures into the background, mowing and reseeding right-of-way corridors, and using materials that match the existing environment to construct access roads. Consultation with the Wyoming SHPO and the Advisory Council on Historic Preservation is required when proposed actions are expected to adversely affect properties eligible for the National Register.

For historic trails, such as the Cherokee Trail, Overland Trail, Rawlins to Fort Washakie Road and Rawlins to Baggs Road, protection measures would be carried out similarly to other historic properties if any project were found to be located within ¼ mile of a contributing portion of the historic trail. When a proposed project is outside of the ¼ mile buffer of the trail, but found to be within the 2-mile viewshed that contributes to NRHP eligibility, analyses of potential impacts to the trails are conducted through viewshed analyses, on-site inspection, and photo inspection. Mitigation measures used to ensure that the contributing viewshed of historic trails are not adversely affected include, but are not limited to, decreasing the height of well tanks, using paint and topography to blend well locations into the background, mowing and reseeding pipeline corridors, and using materials that match the existing environment to construct access roads.

Modification

Under certain circumstances, the protective measures described are modified to take into account emergency situations and the surface management regulations for leasable and locatable minerals.

Wildland Fire Management

The locations of known Native American gravesites would be provided to the Fire Management Officer so that they would not be impacted by wildland fire suppression activities.

Cultural resource inventories would not be required prior to firefighting activities in most cases. On a case-by-case basis, the field office archaeologist may request the opportunity to inventory specific areas prior to their impact by firefighting activities.

The cultural program may conduct post-fire inventory of areas where fire lines were bladed or other substantial surface disturbance took place, and mitigation efforts may be undertaken at the discretion of the Field Office Manager.

Leasable Minerals—Coal

Actions involving coal mining are subject to standard protective measures; however, these procedures are not implemented until a lease has been issued and a mine plan has been prepared. Although some protective measures are addressed in the mine plan, inventory and evaluation of cultural resources are

generally not completed until the mine plan is to be implemented. Responsibility for ensuring that the Section 106 requirements are completed for the mine plan implementation rests with the Office of Surface Mining (OSM). Before a lease is issued, lands that could be included in the lease are reviewed under the coal unsuitability criteria (43 CFR 3461). One criterion that would render lands unsuitable is the presence of cultural resource properties that are included in the NRHP. Cultural resource properties that have been determined to be eligible, but have not been listed, do not fulfill this unsuitability criterion.

Locatable Minerals

For actions involving locatable minerals, standard protective measures are modified to take into account the regulations of 43 CFR 3809. These regulations limit BLM's authority to control surface-disturbing activities associated with locatable minerals activity, particularly where mining activity involves fewer than 5 acres of surface disturbance. Protective measures required for mining activity on fewer than 5 acres are—

- A 15-day notification period before mining activity can begin
- A provision that the operator may not knowingly disturb "any historical or archaeological site, structure, or building on federal lands" (43 CFR 3809.2-2(e)(1))
- A 10-day period in which known cultural resources jeopardized by mining operations can be evaluated, protected, and/or removed by BLM.

Protective measures are less limited when operations involve more than 5 acres. In these cases, a plan of operations must be submitted to BLM for approval. This gives BLM greater latitude to complete inventories and mitigate impacts, although each must be accomplished at BLM's expense and within established time limits. Plans of operations are required for all mining activity within areas of critical environmental concern.

Cultural Resource Laws and Regulations

American Antiquities Act of 1906—provides for permits to authorize scholarly use of properties, for misdemeanor-level penalties to control unauthorized use, and for Presidential designation of outstanding properties as national monuments for long-term preservation.

National Historic Preservation Act of 1966—

- Section 106 directs all federal agencies to take into account effects of their undertakings (actions and authorizations) on properties included in or eligible for the NRHP.
- Section 110 sets inventory, nomination, protection, and preservation responsibilities for federally owned cultural properties. Section 110(c) requires each federal agency to designate a Preservation Officer to coordinate activities under the Act.

American Indian Religious Freedom Act of 1978—establishes the policy of the United States to protect and preserve for the American Indian, Eskimo, Aleut, and Native Hawaiian the inherent right of freedom to believe, express, and exercise their traditional religions. Federal agencies are directed to evaluate their policies and procedures to determine whether changes are needed to ensure that such rights and freedoms are not disrupted by agency practices.

Archaeological Resources Protection Act of 1979—provides felony-level penalties for the unauthorized excavation, removal, damage, alteration, defacement, or the attempted unauthorized removal, damage,

alteration, or defacement of any archaeological resource, more than 100 years of age, found on public lands or Indian lands. The act also prohibits the sale, purchase, exchange, transportation, receipt, or offering of any archaeological resource obtained from public lands or Indian lands.

Native American Graves Protection and Repatriation Act of 1990—requires Native American consultation for the excavation and/or removal of "cultural items" including human remains, funerary objects, sacred objects, and objects of cultural patrimony. Consultation is also required if "cultural items" are discovered during land use activities.

Executive Order No. 13007: Indian Sacred Sites—establishes access to and ceremonial use of Indian sacred sites by Indian religious practitioners on federal lands. The federal agencies shall avoid adversely affecting the physical integrity of such sacred sites and maintain confidentiality of said sites.

APPENDIX 6—LAND EXCHANGE, ACQUISITION, AND DISPOSAL CRITERIA

DISPOSAL CRITERIA

The Federal Land Policy and Management Act of 1976 (FLPMA) provides for retention of the public lands in federal ownership and management by Bureau of Land Management (BLM) for multiple use and sustained yield of the lands and resources, with environmental integrity. Public lands may be transferred from BLM to other federal agencies for management. Disposal by sale, exchange, or Recreation and Public Purpose (R&PP) Act patent remains an option if such an action will serve an important objective and have a public benefit.

Prior to any disposal, a site-specific analysis must determine that the lands considered contain no significant wildlife, recreation, or other resource values, the loss of which could not be mitigated; have no overriding public values; and represent no substantial public investments. Disposal must serve the public interest. Exchange will be the priority method for disposals.

Lands will not be considered for disposal if they are allocated for a specific use, even though they meet the general disposal criteria.

Exchanges

See Land Exchange Criteria below.

Sales

Public land sale proposals are the result of either a BLM initiative or in response to expressed public interest or need. Lands to be considered for disposal, at a minimum, must meet the following criteria as outlined in Section 203 of the FLPMA:

They are difficult and uneconomical to manage, and are not suitable for management by another federal department or agency.

Disposal would serve important public objectives, including but not limited to, community expansion or economic development, that could not be achieved prudently or feasibly on land other than public lands and that outweigh other public objectives or values.

The tract was acquired for a specific purpose and is no longer required for that purpose or any other federal purpose.

Sales and Exchanges Involving Wetlands

BLM policy is to retain wetlands in federal ownership unless federal, state, public, and private institutions and parties have demonstrated the ability to maintain, restore, and protect wetlands and riparian habitats on a continuous basis (BLM Manual 6740). Sales and exchanges may be authorized when—

The tract of public wetlands is either so small or remote that it is uneconomical to manage.

The tract of public wetlands is not suitable for management by another federal agency.

The patent contains restrictions of uses as prohibited by identified federal, state, or local wetlands regulations.

The patent contains restrictions and conditions that ensure the patentee can maintain, restore, and protect the wetlands on a continuous basis.

Recreation and Public Purposes Lease and Patent

The objective of the R&PP Act is to meet the needs of state and local governmental agencies and other qualified organizations for public lands required for recreational and public purposes. Use of the R&PP Act protects public values in the land through its reversionary provisions and helps qualified entities obtain the more liberal pricing authorized under the Act.

Public lands shall be conveyed or leased only for an established or definitely proposed project for which there is a reasonable timetable of development and satisfactory development and management plans. No more land than is reasonably necessary for the proposed use shall be conveyed.

Desert Land Entries

The purpose of the Desert Land Law is to permit the reclamation, by irrigation, of arid public land through individual effort and private capital.

Lands that, without artificial irrigation, will not produce any reasonably remunerative agricultural crop by the usual means or methods of cultivation may be considered for a desert land entry. The lands must be untimbered, surveyed, unreserved, and unappropriated. Tracts need not be contiguous, but shall be sufficiently close to each other that they can be managed satisfactorily as an economic unit.

The proposed crop may include any agricultural product to which the land under consideration is generally adapted and that would return a fair reward for the expense of producing it.

All Desert Land Entry applications will be coordinated with the Wyoming State Engineer and the Soil Conservation Service.

Acquisition Criteria

Acquisition of lands will be considered to facilitate various resource management objectives and to acquire lands with high resource values.

The preferred method for acquisition will be through exchange.

Acquisitions, including easements, can be completed through exchange, Land and Water Conservation Funds (LWCF) purchases or donations.

Acquisitions of private lands will only be pursued with willing landowners.

LAND EXCHANGE CRITERIA

Land Exchange Laws, Regulations, and Policy

The Federal Land Policy and Management Act

In our nation's history, federal lands have been used as a form of payment when the nation was short of cash, to promote settlement of western lands, and to promote resource development policies. Up until the mid-twentieth century, the ultimate goal for federal lands administered by BLM (i.e., public lands) was to transfer them to private ownership.

The FLPMA, passed in 1976, defines public lands as ". . . any land and interest in land owned by the United States within the several States and administered by the Secretary of the Interior through the Bureau of Land Management, without regard to how the United States acquired ownership, except— (1) lands located on the Outer Continental Shelf; and (2) lands held for the benefit of Indians, Aleuts, and Eskimos." The FLPMA marked a change in federal policy toward the public lands. In the Act, Congress declared that it was the policy of the United States that—

> The public lands be retained in Federal ownership, unless as a result of the land use planning procedure . . . it is determined that disposal of a particular parcel will serve the national interest (43 USC 1701, Sec. 102(a)(1)). Uniform procedures for any disposal of public land, acquisition of nonfederal land for public purposes, and the exchange of such lands be established by statute, requiring each disposal, acquisition, and exchange to be considered with the prescribed mission of the department or agency involved, and reserving to the Congress review of disposal in excess of a specified acreage (43 CFR 1701, Sec. 102(a)(10)).

Section 206 of FLPMA further refined Congress' intention about land exchanges.

> A tract of public land or interests therein may be disposed of by exchange . . . [when it is determined] that the public interest will be well served by making that exchange: Provided, That when considering public interest the Secretary concerned shall give full consideration to better Federal land management and needs of State and local people, including needs for lands for the economy, community expansion, recreation areas, food, fiber, minerals, and fish and wildlife and the Secretary concerned finds that the values and the objectives which Federal lands or interests to be conveyed may serve if retained in Federal ownership are not more than the values of the nonfederal lands or interests and the public objectives they could serve if acquired.

Federal law prohibits exchange of public land in one state for private land in another, unless authorized by an act of Congress. Exchanges are to be of equal value, based on a fair market appraisal, and do not have to be of equal acreage. In other words, exchanges are made on a value-for-value basis rather than an acre-for-acre basis. Furthermore, land exchanges are a discretionary BLM action. BLM is not obligated to process every proposal it receives, even if the proposal has some merit. BLM evaluates exchange proposals in light of existing workloads, funding, and other program priorities when deciding to pursue a land exchange proposal.

Bureau of Land Management Exchange Policy

BLM interpreted congressional intent in FLPMA and established 14 general land exchange principles in BLM Manual 2200.06 A (1984). These 14 principles set forth general BLM policy for the exchange of

public lands or interest. They represent a commitment by BLM to implement the land exchange policies of FLPMA, consistent with BLM's other statutory obligations. The complete text of all 14 principles is presented in Attachment A.

The BLM Wyoming State Office issued a public land exchange and sale policy for Wyoming in May 1996 (WY-IM-96-067). The Wyoming BLM policy enlarges on the concept of public interest from section 206 of the FLPMA stating

> All exchange proposals must provide significant public benefits. If an exchange proposal doesn't result in public access, in the acquisition of critical wildlife habitat, in improved management, or in the acquisition of some other significant resource value, the exchange proposal will not be pursued.

In summary, public land exchanges in Wyoming must

- Serve the national interest
- Meet public needs
- Provide significant public benefits.

Land exchanges may further one of the following purposes—

- Acquisition of private holdings in federal conservation areas
- Consolidation or unification of surface and subsurface estates
- Consolidation of ownership and boundary changes to form more logical and efficient management areas.

Federal Land Exchange Facilitation Act

This Federal Land Exchange Facilitation Act (FLEFA) was passed in August 1988, and final regulations were published in November 1993. These regulations are process-oriented procedures and do not change basic federal or BLM policy toward acceptable exchange proposals.

Resource Management Plans

The resource and land use management decisions in BLM resource management plans (RMP) are developed to allocate appropriate resource and land uses for the public lands. RMP decisions also establish practices to manage and protect public lands and resources, and they may identify lands suitable for consideration for disposal or acquisition. Public land users contribute to the development of RMPs by identifying problems, concerns, and issues involving the public lands in the planning areas; BLM ensures that the environmental analyses for the RMPs and the RMP decisions are responsive to these issues and concerns, to the extent allowed by law. RMP decisions must also consider and be consistent with state and local government land use plans, to the extent allowed by law.

Historical Context of the Great Divide RMP

RMPs are issue-driven documents. That is, public comment and BLM staff identify the public land and resource use problems, concerns, and issues that will be addressed in developing the RMP. Thus, RMPs strongly reflect the concerns in existence when they are prepared. Data were gathered for the Environmental Impact Statement (EIS) for the Great Divide RMP (Medicine Bow-Divide RMP Draft and Final EISs) in 1984–86. The Final EIS was issued in February 1987, and the Record of Decision (ROD) for the Great Divide RMP was signed in November 1990.

This period marked the conclusion of the Asset Management Program. This initiative sought to dispose of unneeded or unused federal assets (including sale of federal lands). Proceeds from these sales were intended to reduce the national debt and agency operating costs. The program ended in 1986 after only a small amount of federal land was disposed of. In the Great Divide Resource Area (GDRA), 160 acres in Laramie County were sold. Another factor influencing the land tenure issue (sales and exchanges) in the RMP was the mineral industry "bust" in 1980–1982. With a decline in industry operations, population declined. The Carbon County population declined from 22,000 in 1980 to approximately 16,000 in 1984. A declining economy and reduced land values contributed to a reduced interest in federal land exchanges or sales at that time.

Great Divide RMP Decisions

The Great Divide RMP addressed the land tenure issue within the context of the above circumstances and interests. The selections below from the RMP Draft EIS provide a clear summary of the intent of the land tenure decisions in the RMP.

> The BLM's management programs are affected by the broken landownership pattern in portions of the planning area. Implementing management plans on scattered lands is difficult because management practices on surrounding private lands tend to influence land use on public lands. Most of the small parcels lack legal public access, and unauthorized use is common. Often the costs of detecting and terminating trespass, managing grazing use, and processing rights-of-way and other applications for land use exceed the monetary returns from such uses. Landownership adjustments present opportunities to improve this situation. Such adjustments can be made through sale or exchange.
>
> Exchanges serve several purposes, among them consolidation of landownership to facilitate resource management. Exchanges also can help in the accomplishment of resource management programs by enabling the BLM to acquire land with high public resource values.
>
> Cities and towns in the planning area may need to acquire land for expansion purposes. These include Baggs, Bairoil, Creston Junction, Rawlins, Red Desert, and Wamsutter. Bairoil's needs are critical because public land is conflicting with the town's orderly expansion. The growing community is surrounded by "blocked" public land. Landownership adjustments present an opportunity to address this problem.
>
> An easement acquisition program in the checkerboard would provide access only to public lands within, at most, one mile of the particular road acquired. However, there are opportunities in the planning area for acquisition of public access to areas that could meet important resource management objectives. Acquisition of easements can be accomplished through either the exchange program or the access program (p. 109–110).

The Great Divide RMP identifies approximately 66,000 acres as "available for consideration for disposal" by employing the "isolated, difficult or expensive to manage, or needed-for community expansion" disposal criteria in the FLPMA. These lands are specifically identified within the RMP. They comprise all the public lands in Laramie County, most of the public lands in southern Albany County, and selected parcels around the communities of Baggs, Bairoil, Creston Junction, Rawlins, Red Desert, Saratoga, and Wamsutter. No other specific, potential public land disposal areas are identified in the RMP. It should also be noted that the inventory of public lands that meet the FLPMA disposal criteria was not completed for the entire RMP planning area. The RMP will be updated to include wording to clarify that these lands are simply those that were identified during the planning effort as meeting the FLPMA disposal criteria, but no RMP decision has been made to the effect that they will be disposed of or that they are the only

public lands in the planning area that may be considered for disposal. The RMP does state, "Proposals for disposal of lands not identified as meeting the FLPMA criteria will be considered if they are consistent with the objectives of the RMP" (p. 15). The RMP also states, "The preferred method of disposal or acquisition of lands by BLM will be through exchanges" (p. 15).

The RMP does not identify land acquisition areas but does identify areas needing improved access.

The RMP Decisions in Current Context

Land ownership adjustment was not a primary issue during development of the Great Divide RMP and is addressed in the RMP only in a narrow context. Consequently, there is little guidance in the RMP regarding how land exchanges should be pursued or what priority they should receive.

The intent of certain phrases used in the RMP decisions is unclear when applied to current land exchange proposals. The following is the clarification of these terms in relation to exchanges.

The phrase to "**protect, maintain or improve**" is applied to a variety of resource decisions in the RMP, for example, "maintain or improve . . . high priority standard habitat sites" or "protect, maintain and control a viable, healthy herd of wild horses" (p. 41). The use of this phrase in relation to any resource does not preclude disposal of public lands upon which these resources occur or rely. The operative objective of these decisions is toward the resource as a whole. If disposal of public lands containing a specific resource will not reduce BLM's ability to protect, maintain, or improve, or if through the exchange, private lands would be acquired that would advance the resource objectives, then the exchange would be consistent with RMP objectives.

The concept of **blocking public land into larger parcels** (consolidating landownership), and the relative size of those parcels, is an ill-defined concept in the RMP. Blocking public land into larger parcels, absent any other resource benefits, is not necessarily in the public interest. In addition, there is no minimum block size that would automatically preclude consideration of an exchange proposal. Certainly, the larger the block, the more efficient and effective future land management would be. However, highly valued, narrowly distributed resources could make consolidation of a relatively few acres a reasonable land exchange proposal. This principle can apply to a block of federal land with valuable or unique resources in an area that is dominated by private land, or it can apply to eliminating small parcels of private land in an area dominated by federal lands. Blocking land can also refer to creating large blocks of federal and private land in areas of checkerboard landownership. Consolidation of land ownership in and of itself, however, is not sufficient justification for pursuing an exchange.

The issue of exchanging **like-for-like resources** and **lands within the immediate vicinity of each other** also influences the feasibility of an exchange proposal. If the resources on proposed exchange parcels were similar, there would be less disagreement over the relative value of these lands. However, parcels are seldom alike. Thus, BLM must consider giving up one type of resource to acquire another. Such disparity does not, in and of itself, preclude consideration of an exchange proposal. Experience has shown that the more dissimilar the lands, the more difficult the proposal will be to complete. As with resources, if parcels were adjacent, or at the least, near each other, the proposal would be less complicated than if the parcels were widely separated.

Land Exchange Criteria

The final part of this document clarifies the possibilities for land exchanges within the context of RMP decisions. If land exchanges involved identical lands and resources of equal value, and met the differing objectives of private landowners and federal agencies, there would be little controversy about these

proposals. In reality, this is never the case. Land exchanges often include a diverse mix of resources on often-dissimilar lands, located at some distance from each other. The larger the exchange proposal is, the greater, or more complex, the dissimilarities.

For each of the resource categories below, a range of attributes, from more to less acceptable, is given in the context of land exchange proposals. Some attributes may preclude disposal, and others will have little or no influence in evaluating a proposal. A point ranking system will not be used because the variable nature of these issues is best addressed through a qualitative, narrative format.

The purpose of this criteria is to: (1) present BLM land exchange policy; (2) examine the BLM land use planning process in relation to decisions in the Great Divide Resource Area Record of Decision/Approved RMP; and (3) clarify and explain the Great Divide RMP decisions as they relate to land exchange proposals, to assist in determining whether a proposed exchange is consistent with BLM policy and the RMP decisions.

This criteria will help land exchange proponents formulate realistic exchange proposals, provide BLM staff and management with clear and consistent guidelines against which to evaluate proposals, and better inform the public about the BLM land exchange program.

General Criteria

- All land exchanges will be in conformance with national BLM Policy in BLM Manual 2200 and Wyoming BLM Policy in WY-IM-96-067, summarized above.
- BLM must meet the requirements of BLM Manual H-2104, "Preacquisition Environmental Site Assessment" to "determine if recognized environmental conditions are present which would pose an imminent threat or long term risk to human health and/or the environment."
- The public lands identified as being possibly suitable for disposal within the RMP meet FLPMA criteria and are suitable for disposal consideration.
- Land exchanges should improve BLM's public land and resource management capabilities. Protecting resources and/or implementing management actions on acquired public lands or disposing of public lands that are difficult or expensive to manage and which contain little public value can achieve this goal.
- Land exchanges should create more logical and efficient land ownership patterns. This can be accomplished by making boundaries less irregular, matching legal and physical access or boundary areas, and reducing the number of ownership parcels, either federal or nonfederal, in an area. Every effort will be made to preserve or enhance public access through the exchange process.
- Conservation easements or other protective covenants are occasionally used to provide for continued protection of valuable public resources when the land itself is transferred out of federal ownership.

Areas of Critical Environmental Concern

Areas of Critical Environmental Concern (ACEC) are "areas within the public lands where special management attention is required . . . to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards" [FLPMA, Sec. 103(a)]. Neither FLPMA nor the Great Divide RMP

decisions concerning the four designated ACECs in the RMP planning area preclude disposal of public lands within an ACEC.

The attribute scale for land exchanges involving ACECs is—

- Nonfederal land within an ACEC for public land outside the ACEC boundary.
- Nonfederal land for public land within an ACEC (land ownership consolidation), provided the integrity and management objectives of the ACEC could be maintained, either by the new land ownership alignment or by a conservation easement on the disposed public land.
- A proposal that results in a better-defined ACEC boundary, provided the integrity and management objectives of the ACEC are not impaired.
- Public land within an ACEC for nonfederal land outside an ACEC, provided the management objectives of the ACEC are preserved on the disposed public land.

In addition to the general ACEC attribute scale, any land exchange proposal that would improve public access in the Jep Canyon or Shamrock Hills ACECs would improve a land exchange proposal's ranking.

Cultural Resources

- Public lands containing cultural resources that are neither eligible for nor enrolled on the National Register of Historic Places (Register) or historic trail segments that do not contribute to eligibility for or enrollment on the Register will be considered for exchange.
- Public lands that contain properties that are eligible for or enrolled on the Register will *not* be considered for exchange unless impacts to the cultural resources are mitigated by data recovery, documentation, or other acceptable procedure, or the cultural resources are reserved to the United States in the patent.
- Public lands that contain contributing historic trail segments will *not* be considered for exchange unless the contributing trail segments plus a quarter-mile buffer on both sides of the trail are reserved to the United States in the patent.
- Consolidation of National Register-eligible historic or contributing trail segments into federal ownership will be considered, even if other isolated trail segments on public land are exchanged, provided public access to the trail in general would be enhanced and/or endangered segments were brought into federal ownership.
- Exchange of public lands containing cultural resources on or eligible for the Register will be considered if the nonfederal lands to be acquired hold some other resource of exceptional public value (e.g., endangered species critical habitat).
- A land exchange involving federal and nonfederal cultural resources of approximately equal amount and value will be considered. (It would be difficult to achieve this criterion because identification of like resources would require an inventory of all acquired parcels.)

National Natural Landmarks

- Nonfederal land within a National Natural Landmark (NNL) will be considered for exchange for public land outside of the NNL boundary.

- Public land for nonfederal land within an NNL (land ownership consolidation) will be considered for exchange, provided the integrity and management objectives of the NNL could be maintained, either by the new land ownership alignment or by a conservation easement on the disposed public land.
- A proposal that results in a better-defined NNL boundary will be considered for exchange, provided the integrity and management objectives of the NNL would not be impaired.
- Public land in an NNL will be considered for exchange for nonfederal land outside an NNL, provided the management objectives of the NNL would be preserved on the disposed public land by a conservation easement.
- Public land within an NNL will be considered for exchange for nonfederal land outside the NNL, provided the integrity and management objectives of the NNL could be maintained.

Paleontological Resources

- Public lands that contain low-value paleontological resources will be considered for exchange.
- Public lands that contain paleontological resources of high scientific importance (usually vertebrate fossils) will *not* be considered for exchange unless the paleontological resource impacts are mitigated by data recovery or documentation or the paleontological resources are reserved to the United States in a patent.
- A land exchange involving public lands containing high-value paleontological resources for nonfederal lands that hold some other resource of exceptional public value (e.g., endangered species critical habitat) will have a low priority.
- A land exchange involving federal and nonfederal paleontological resources of approximately equal amount and value would also be low priority. (It would be difficult to achieve this criterion because paleontological resources are inventoried after the exchange parcels are identified, and many are not discovered by a surface examination.)

Forest Resources

- The presence of merchantable timber, in and of itself, would not preclude disposal of public lands. Timber values must be considered along with other land values to meet equal-value exchange requirements.
- Public land adjacent to and having a common boundary with a national forest, or when an existing access road exists, will have an extremely low priority for exchange.

Existing Lands Authorizations and Designations

- Existing rights-of-way (ROW) grants will not prevent those public lands containing ROWs from being disposed of. The patent will require the preservation of the existing authorization until the end of the grant.
- Public lands containing classifications or that are withdrawn from the general land laws (e.g., R&PP Act, Desert Land Act, Power Site Classification, Public Water Reserve withdrawals, Stock Driveway withdrawals, or various mineral withdrawals) will have a low priority for exchange. However, many of the classification and withdrawal designations are out of date and have not

been administratively reviewed and adjusted. If such a designation is present on a selected public land parcel, it should be evaluated according to its specific circumstances.

Livestock Grazing Management and Vegetation

- Isolated parcels of public land within predominately private land grazing allotments will be considered for exchange for nonfederal land outside the grazing allotment. The elimination of isolated parcels of public land from grazing allotments, thereby eliminating the need for continuation of a BLM-administered grazing allotment, would reduce the administrative workload of the BLM and would therefore be a benefit of a land exchange.
- The gain or loss of a particular vegetation type or amount of forage (animal unit months) will not preclude consideration of public lands for disposal.

Mineral Resources

Mineral values will be considered, along with surface values, in determining the total exchange value of land parcels. The extent of mineral deposits is seldom known with a high degree of accuracy. This uncertainty can introduce an element of controversy into an exchange proposal.

- Land exchanges that propose to exchange both surface and mineral estate are preferable to those that do not, provided the total values are equal.
- Proposals that eliminate a mineral and land surface split estate ownership situation by creating a united mineral and land surface ownership are also preferable.
- Lands containing mining claims filed under the General Mining Law may be considered for exchange. Prior to exchange, claims would have to be relinquished by the claimant or a validity exam completed.

Recreation Sites and Special Recreation Management Areas (SRMA)

Continental Divide SRMA and North Platte River SRMA

- Preferred land exchanges would provide access to and along the Continental Divide National Scenic Trail SRMA and the North Platte River SRMA while disposing of public land outside of these areas.
- Exchange of public land along or within either SRMA would require that access be preserved through an easement or reservation.

Shirley Mountain Caves SRMA

- Nonfederal land within the SRMA will be considered for exchange for public land outside but not adjacent to the SRMA boundary.
- Nonfederal land within the SRMA will be considered for exchange for public land outside and adjacent to the SRMA boundary.
- Public land will be considered for exchange for nonfederal land within the SRMA (land ownership consolidation), provided the integrity and management objectives of the SRMA could be maintained, either by the new land ownership alignment or by a conservation easement on the disposed public land.

- Public land within the SRMA will be considered for exchange for nonfederal land outside, but adjacent to the SRMA, provided the integrity and management objectives of the SRMA could be maintained.
- Any exchange proposal will be considered that would result in a better-defined SRMA boundary, provided the integrity and management objectives of the SRMA would not be impaired.
- An exchange of public land in the SRMA for nonfederal land outside the SRMA, even provided the management objectives of the SRMA would be preserved on the disposed public land by a conservation easement, would be a low priority.

Other Recreation Sites

- Developed recreation sites on public lands (and appropriate buffers around them) will be considered low priority for exchange.

Soil Resources

This section includes consideration of soil productivity, erosion potential, and geologic hazards, such as subsidence and landslide areas.

- Acquisition nonfederal land containing native, undisturbed vegetation for disturbed or unreclaimed public land will be considered.
- Acquisition of nonfederal land that contains geologic hazards known to pose an immediate threat to human health or safety would be of low priority. Special circumstances may arise that would make acquisition of a particular geologic hazard advantageous to BLM (e.g., extremely precipitous canyon/cliff country that is very hazardous to human health and safety but is excellent raptor habitat).
- Acquisition of nonfederal land with an ongoing accelerated erosional process, requiring immediate expenditure of funds to correct, for public land would be a low priority (unless BLM was cooperatively working with other agencies to meet national or regional water quality objectives).

Visual Resource Management (VRM)

- VRM classification will not preclude consideration of public lands for exchange.
- BLM exchange of public land in Class I or II VRM areas will be a low priority, unless in special circumstances, a conservation easement protects the visual integrity of the area.

Water, Wetlands, and Riparian Areas

- Proposals for exchange will be considered that acquire more wetlands and/or riparian areas than are disposed of.
- Proposals that exchange essentially the same amount, type, and quality of wetlands or riparian areas will be considered.
- Proposals for exchange will be considered that dispose of more wetlands and/or riparian areas than are acquired by BLM, provided the wetlands/riparian areas are protected by a conservation easement.

- Lowest preference for consideration is given to proposals that dispose of more wetlands and/or riparian areas than are acquired by BLM, in order to acquire some other valuable resource or lands, with no conservation easement protection of the disposed public lands.

Wild Horses

- Proposals for exchange will be considered that acquire more nonfederal land within wild horse herd management areas than are disposed of.
- Proposals that exchange essentially the same amount, type, and quality of wild horse herd management area will be considered.
- Proposals for exchange will be considered that dispose of more wild horse herd management area lands than are acquired by BLM, or that create isolated parcels of nonfederal land within wild horse herd management areas in order to acquire some other valuable resource or lands.

Wildlife, Threatened and Endangered Species, and Sensitive Plants Habitat

Crucial Winter Ranges for Big Game

Consideration of crucial winter ranges (CWR) in land exchanges must include evaluation of species type, different range areas, quality of the range, herd population levels and health, and the results of consultation with the Wyoming Game and Fish Department (WGFD). Generally, exchange proposals involving CWR for multiple big game species will have priority over proposals involving CWR for only one big game species. Each proposal, however, will be considered on its own merits. Exchange proposals may involve CWR for pronghorn antelope, mule deer, elk, moose, big horn sheep and/or white-tailed deer. Examples of proposals that would be considered (but not listed in any priority order) are—

- Proposals that acquire more CWR than is transferred to nonfederal ownership for one or more big game species in the same CWR
- Proposals in which poor-quality public land CWR is exchanged for better-quality CWR for one or more big game species in the same CWR
- Proposals that exchange nearly equal acreages of CWR, for the same or multiple species, in the same CWR
- Proposals in which CWR is transferred from federal ownership to nonfederal ownership, but the former federal lands (and the habitat) are preserved by a conservation easement.

Strutting/Dancing Grounds and Nesting Habitats

Generally, proposals involving sage-grouse or sharp-tailed grouse strutting/dancing grounds and nesting habitats would be evaluated on the basis of the quality of the habitat, the local population levels/histories, and the results of consultation with the WGFD. Examples of proposal that would be considered (but not listed in any priority order) are—

- Proposals that acquire more of these habitats than are transferred into nonfederal ownership
- Proposals that result in exchange of approximately equal mounts of these types of habitat
- Proposals that result in a net federal reduction in acres of these types of habitats, but the former public lands (and the habitat values) are preserved by a conservation easement

- Proposals that result in more acres of these habitats transferred into nonfederal ownership than are acquired.

Threatened, Endangered, Sensitive Species

Proposals involving the acquisition of Threatened and Endangered (T&E) or otherwise sensitive plant or animal species habitat would generally be considered high-priority actions. Proposals could involve black-footed ferret or mountain plover habitat (prairie dog colonies), Ute-ladies' tresses habitat, or habitat associated with other special status species. Generally proposals would be evaluated on the basis of the quality of the habitat, the acreage of habitat involved, and the results of consultation with both the U.S. Fish and Wildlife Service and the WGFD. Example proposals would be similar to those described above for big game species and for sage-grouse and sharp-tailed grouse.

Wilderness Study Areas

- High priority is given to land exchange proposals in which nonfederal holdings within Wilderness Study Area (WSA) boundaries are acquired for federal ownership.

Generally, lands under wilderness review may not be disposed of through any means, including exchanges.

Attachment A

BLM Manual 2200, Exchange of Public Lands

.06 Policies

A. General. The following principles set forth general BLM policy for the exchange of public lands or interest therein. They represent a commitment by BLM to implement the land exchange policies of the FLPMA, consistent with BLM's other statutory obligations.

1. Disposal of public lands by exchange shall be considered as serving the national interest within the policy context of Section 102(a)(1) of FLPMA.

2. The BLM shall strive to process mutually benefiting, public interest, land exchanges in a timely and efficient manner through continually maintaining and streamlining its land use planning, appraisal, and exchange processes.

3. Exchanges to acquire in holdings in Federal conservation areas are in the public interest and will aid in the reduction of the national debt through reducing expenditures of appropriated funds in the acquisition of lands or interest in lands needed for Federal conservation purposes.

4. Acquisitions, through exchange rather than purchase, of lands or interests in lands required for Federal resource management or protection program will retard the present expansion of Federal real estate holdings and help assure the integrity of State and local tax bases.

5. Comments from affected States, local governments, and the general public shall be sought and considered before completion of each exchange.

6. Exchanges may be utilized, when economically advantageous, to consolidate attractive parcels for sale.

7. Patent and deed reservations and conditions shall be kept to the absolute minimum necessary to complete the transaction. Rights of third parties holding rights-of-way and other interests in the exchanged lands shall be protected.

8. The generally preferred rule is for both surface and subsurface (mineral) estates to be traded in an exchange. However, due to third party encumbrances, or difficulties in the valuation process, it may be preferable to complete certain exchanges with reservations. Such exceptions to the generally preferred rule are to be made on a case-by-case basis.

9. Exchanges shall be utilized to consolidate or unite the surface and subsurface estates for both the Federal Government and nonfederal owners in split or mixed estate situations.

10. Exchanges by be utilized to effect ownership and management area boundary changes or adjustments and to form more logical and efficient land and resource managements areas for both the Federal Government and nonfederal owners.

11. In application of the determinations of public interest required under Section 206(a) of FLPMA, the BLM shall give the broadest possible consideration of public needs when evaluating exchange proposals.

12. Whenever the law permits, expenses incurred by BLM on exchange sections for the benefit of other Federal agencies shall be recovered from such benefiting agency. The BLM shall not attempt to recover nominal costs.

13. Mining claims of record shall be contested only for the purpose of determining the validity of such claims in those instances in which an exchange has been determined to be in the public interest. Expenditures of limited Federal appropriations will not be made simply to clear the land of mining claims of one party to make the land available for another party.

14. When an exchange involves the cancellation of a grazing permit or lease, the compensation for range improvements and two-year notification requirements of Sections 402(g) of the FLPMA and 43 CFR 4110 shall be met.

APPENDIX 7—LANDS CONSIDERED FOR DISPOSAL, WITHDRAWAL, AND ACQUISITION

LANDS IDENTIFIED AS POSSIBLY SUITABLE FOR DISPOSAL

Alternative 1 (The No Action Alternative)

Table A7-1. Lands Identified as Possibly Suitable for Disposal—Alternative 1—Laramie County

Acres	Township	Range	Section: Lot or Legal
40	12	60	20: S½S½SE¼.
40	13	60	2: E½E½SW¼;
320			28: W½.
440	16	68	24: SW¼NE¼, S½NW¼, S½.
440			25: SW¼NE¼, S½NW¼, S½
40	12	69	2: SW¼NW¼;
40			4: SW¼NW¼.
40	16	69	19: SE¼SW¼.
40	12	70	2: SE¼NE¼;
40			10: SW¼NW¼.
400	14	70	2: E½E½, NW¼NE¼, SW¼, SW¼SE¼;
320			4: S½;
360			6: N½N½, N½S½, SW¼SW¼
120			8: N½NE¼, NE¼NW¼;
160			10: N½N½;
160			12: NW¼;
360			24: NW¼NE¼, S½
40	15	70	6: NW¼NW¼
240			20: N½S½, SW¼SW¼, SE¼SE¼
240			22: S½SW¼, SE¼
480			28: N½, SW¼.
80			30: N½NW¼
640			32: ALL
640			34: ALL
240	18	70	5: NW¼, N½SW¼;
40			6: NE¼NE¼.
80	19	70	11: S½SE¼;
80			26: NW¼SW¼, SE¼SW¼.

Table A7-2. Lands Identified as Possibly Suitable for Disposal—Alternative 1—Albany County

Acres	Township	Range	Section: Lot or Legal
40	17	70	6: NW¼NW¼.
40	18	70	6: NW¼NW¼.
160	13	71	4: S½S½.
240	14	71	32: S½N½, SE¼SW¼, SW¼SE¼.
40	17	71	2: NW¼SE¼.
80	18	71	2: SW¼NW¼, NW¼SW¼.
40	19	71	11: SE¼NW¼;
40			13: NE¼NE¼;
100			23: NW¼SW¼, E½SW¼SW¼, SE¼SW¼;
480			26: E½, E½W½;

Acres	Township	Range	Section: Lot or Legal
640			32: ALL
40			34: SE¼SE¼.
160	20	71	14: S½S½;
240			23: W½NE¼, NW¼;
40			24: NE¼SW¼;
40			25: SE¼SW¼;
240			26: E½NW¼, SW¼NW¼, NW¼SW¼, E½SW¼;
320			27: E½NE¼, NW¼NW¼, SW¼, SW¼SE¼;
120			34: S½NW¼, NW¼SW¼.
40	12	72	2: NE¼NE¼.
640	17	72	6: ALL
640			8: ALL.
320	18	72	6: NW¼, SE¼;
160			18: SW¼;
480			30: W½, SE¼;
120			32: S½SW¼, NE¼SW¼.
160	19	72	10: NE¼NE¼, N½NW¼, NW¼SE¼;
320			30: E½NE¼, W½W½, S½SE¼;
320			34: W½.
160	20	72	2: NW¼NE¼, NE¼NW¼, S½SE¼;
40			10: SW¼NE¼;
70			34: SE¼NE¼,N½NW¼NW¼,SE¼NW¼NW¼,
40			NE¼SE¼.
160	13	73	22: NE¼NE¼, N½NW¼, SW¼NW¼
160	18	73	2: N½S½;
640			6: ALL
640			8: ALL
260			12: SE¼NE¼, SE¼NW¼, SW¼, NW¼SE¼;
640			14: ALL
640			18: ALL
480			30: N½, SW¼.
640	19	73	26: ALL.
420	12	74	4: E½E½, NW¼NE¼, NE¼NW¼, W½SE¼;
480			10: E½NE¼, W½, S½SE¼;
40			20: NE¼NE¼;
160			22: N½N½;
160			24: N½N½.
160	13	74	8: NE¼;
120			10: SE¼NE¼, E½SE¼
40			12: NE¼NE¼;
240			28: NW¼, W½SW¼.
640	15	74	8: ALL.
80	16	74	10: NE¼NE¼, SE¼SE¼;
320			12: W½;
160			13: S½N½
120			14: S½NE¼, SE¼NW¼.
480			18: S½N½, S½
160	17	74	28: SW¼.
640	12	75	6: ALL
640			10: ALL
160			14: SW¼.
40	13	75	12: NE¼SW¼;
120			14: N½NW¼, SW¼SW¼;
640			20: ALL
20			22: W½NW¼NW¼;
200			28: NW¼, SW¼SW¼;
640			30: ALL
160			34: S½N½.

Acres	Township	Range	Section: Lot or Legal
160	15	75	24: SW¼.
640	16	75	26: ALL
640			30: ALL.
80	17	75	2: S½SE¼.
480	18	75	2: N½N½,SW¼NE¼,S½NW¼,SW¼,NW¼SE¼;
640			6: ALL
640			8: ALL
280			12: SE¼NE¼, SE¼NW¼, SW¼, NW¼SE¼;
640			14: ALL
640			18: ALL
480			30: N½, SW¼.
320	13	76	2: S½;
640			12: ALL
640			14: ALL
640			24: ALL
640			26: ALL.
640	15	76	2: ALL
320			6: S½;
640			8: ALL
480			12: NW¼NE¼, W½, W½SE¼, SE¼SE¼
360			18: N½, SW¼SW¼;
120			20: SE¼NW¼, E½SW¼.
160			28: S½S½
240			34: S½NE¼, NW¼
120	16	76	4: W½NW¼, NW¼SW¼;
320			6: N½.
80	17	76	4: S½SW¼;
640			6: ALL
480			8: W½E½, W½;
80			10: S½SE¼;
640			14: ALL.
320	18	76	4: N½;
560			6: N½, N½S½, S½SW¼;
480			8: E½, SW¼;
480			10: N½, SW¼;
640			14: ALL
640			18: ALL
640			22: ALL
640			24: ALL
520			26: N½, N½S½, SE¼SW¼, S½SE¼;
40			28: NW¼SW¼.
120	16	77	4: W½NW¼, NW¼SE¼;
160			6: S½S½;
160			8: N½N½;
360			10: S½NE¼, S½SW¼, NE¼SW¼, SE¼;
40			18: SW¼ SE¼;
640			20: ALL
640			22: ALL
640			30: ALL
160			31: N½NE¼, SE¼NE¼, NE¼NW¼.
280	17	77	12: E½NE¼, SE¼NE¼, NW¼;
480			22: S½N½, S½;
320			24: N½;
360			34: N½N½, S½NE¼, N½SE¼, SE¼SE¼.
120	18	77	12: E½SE¼, SW¼SE¼;
320			14: E½E½, SW¼NE¼, SE¼NW¼, W½SE¼;
320			26: ALL.
640			34: ALL

Acres	Township	Range	Section: Lot or Legal
80	19	77	32: S½SE¼.
160	20	77	2: W½E½.
240	15	78	12: N½NW¼, SW¼NW½, NE¼SW¼, N½SE¼
160	16	78	12: N½N½
480			13: S½N½, S½
80			26: S½NW¼
160			27: NE¼

Table A7-3. Lands Identified as Possibly Suitable for Disposal—Alternative 1—Carbon County

Acres	Township	Range	Section: Lot or Legal
160	18	78	8: SW¼
200			24: SE¼NE¼, SE¼.
80	20	79	32: S½SE¼.
320	21	87	4: N½.
640			6: All
280			18: W½NE¼, NW¼, SW¼SW¼;
320			20: S½
80			26: S½SE¼;
240			30: NW¼NE¼, W½W½, SE¼SW¼
640			32: ALL
640			34: ALL.
40	22	87	34: SE¼SE¼.
160	12	90	8: SE¼
40			17: NE¼NE¼
280	12	91	9: SW¼SW¼, E½SW¼
120			10: SE¼SW¼, S½SE¼;
160			13: W½NW¼, S½SW¼;
40			14: SW¼NW¼;
80			15: E½NE¼;
40			17: SW¼SW¼.
160	15	92	17: NW¼
640	20	92	12: ALL.
640	19	94	2: ALL
640	20	94	26: ALL
640			28: ALL

Table A7-4. Lands Identified as Possibly Suitable for Disposal—Alternative 1—Sweetwater County

Acres	Township	Range	Section: Lot or Legal
240	20	94	34: W½W½NW¼, SE¼NW¼, SW¼.
600	20	95	32: N½, W½SW¼, SE¼SW¼, SE¼.

Lands Identified for Direct Sale to Towns for Community Expansion

Table A7-5. Lands Identified for Community Expansion—Alternative 1—Carbon County

Acres	Township	Range	Section: Lot or Legal	
240	17	83	8: N½S½, S½SE¼.	City of Saratoga
40	21	87	18: SW¼SW¼.	City of Rawlins

Table A7-6. Lands Identified for Community Expansion—Alternative 1—Sweetwater County

Acres	Township	Range	Section: Lot or Legal	
480	26	90	2: W½E½, W½;	
320			3: W½;	
160			10: NW¼;	
40			11: NW¼NE¼.	City of Bairoil
640	19	94	4: ALL	
160			24: SW¼.	City of Wamsutter

61,010 Approximate Total Acres (Alternative 1)

Alternative 2

Table A7-7. Lands Identified as Possibly Suitable for Disposal—Alternative 2—Laramie County

Acres	Township	Range	Section: Lot or Legal
40	12	60	20: S½S½SE¼.
40	13	60	2: E½E½SW¼;
320			28: W½.
440	16	68	24: SW¼NE¼, S½NW¼, S½.
40	12	69	2: SW¼NW¼;
40			4: SW¼NW¼.
40	16	69	19: SE¼SW¼.
40	12	70	2: SE¼NE¼;
40			10: SW¼NW¼.
500	14	70	2: E½E½, NW¼NE¼, SW¼, SW¼SE¼;
320			4: S½;
120			8: N½NE¼, NE¼NW¼;
160			10: N½N½;
160			12: NW¼;
40			24: NW¼NE¼.
480	15	70	28: N½, SW¼.
240	18	70	5: NW¼, N½SW¼;
40			6: NE¼NE¼.
80	19	70	11: S½SE¼;
80			26: NW¼SW¼, SE¼SW¼.

Table A7-8. Lands Identified as Possibly Suitable for Disposal—Alternative 2—Albany County

Acres	Township	Range	Section: Lot or Legal
40	17	70	6: NW¼NW¼.
40	18	70	6: NW¼NW¼.
160	13	71	4: S½S½.
80	14	71	32: SE¼SW¼, SW¼SE¼.
40	17	71	2: NW¼SE¼.
80	18	71	2: SW¼NW¼, NW¼SW¼.
40	19	71	11: SE¼NW¼;
40			13: NE¼NE¼;
100			23: NW¼SW¼, E½SW¼SW¼, SE¼SW¼;
480			26: E½, E½W½;
640			32: ALL
40			34: SE¼SE¼.

Acres	Township	Range	Section: Lot or Legal
160	20	71	14: S½S½;
240			23: W½NE¼, NW¼;
40			24: NE¼SW¼;
40			25: SE¼SW¼;
240			26: E½NW¼, SW¼NW¼, NW¼SW¼, E½SW¼;
200			27: SW¼, SW¼SE¼;
120			34: S½NW¼, NW¼SW¼.
40	12	72	2: NE¼NE¼.
640	17	72	6: ALL
640			8: ALL.
320	18	72	6: NW¼, SE¼;
160			18: SW¼;
480			30: W½, SE¼;
120			32: S½SW¼, NE¼SW¼.
160	19	72	10: NE¼NE¼, N½NW¼, NW¼SE¼;
320			30: E½NE¼, W½W½, S½SE¼;
320			34: W½.
80	20	72	2: S½SE¼;
40			10: SW¼NE¼;
70			34: SE¼NE¼,N½NW¼NW¼,SE¼NW¼NW¼,
40			NE¼SE¼.
160	18	73	2: N½S½;
640			6: ALL
640			8: ALL
280			12: SE¼NE¼, SE¼NW¼, SW¼, NW¼SE¼;
640			14: ALL
640			18: ALL
480			30: N½, SW¼.
640	19	73	26: ALL.
320	12	74	4: E½E½, NW¼NE¼, NE¼NW¼, W½SE¼
480			10: E½NE¼, W½, S½SE¼;
40			20: NE¼NE¼;
160			22: N½N½;
160			24: N½N½.
160	13	74	8: NE¼;
40			12: NE¼NE¼;
240			28: NW¼, W½SW¼.
640	15	74	8: ALL.
80	16	74	10: NE¼NE¼, SE¼SE¼;
320			12: W½;
120			14: S½NE¼, SE¼NW¼.
160	17	74	28: SW¼.
640	12	75	6: ALL
640			10: ALL
160			14: SW¼.
40	13	75	12: NE¼SW¼;
120			14: N½NW¼, SW¼SW¼;
640			20: ALL
20			22: W½NW¼NW¼;
200			28: NW¼, SW¼SW¼;
640			30: ALL
160			34: S½N½.
160	15	75	24: SW¼.
640	16	75	26: ALL
640			30: ALL.
80	17	75	2: S½SE¼.
480	18	75	2: N½N½,SW¼NE¼,S½NW¼,SW¼,NW¼SE¼;
640			6: ALL

Acres	Township	Range	Section: Lot or Legal
640			8: ALL
280			12: SE¼NE¼, SE¼NW¼, SW¼, NW¼SE¼;
640			14: ALL
640			18: ALL
480			30: N½, SW¼.
320	13	76	2: S½;
640			12: ALL
640			14: ALL
640			24: ALL
640			26: ALL.
320	15	76	6: S½;
640			8: ALL
360			18: N½, SW¼SW¼;
120			20: SE¼NW¼, E½SW¼.
120	16	76	4: W½NW¼, NW¼SW¼;
320			6: N½.
80	17	76	4: S½SW¼;
640			6: ALL
480			8: W½E½, W½;
80			10: S½SE¼;
640			14: ALL.
320	18	76	4: N½;
560			6: N½, N½S½, S½SW¼;
480			8: E½, SW¼;
480			10: N½, SW¼;
640			14: ALL
640			18: ALL
640			22: ALL
640			24: ALL
600			26: N½, N½S½, SE¼SW¼, S½SE¼;
40			28: NW¼SW¼.
120	16	77	4: W½NW¼, NW¼SE¼;
160			6: S½S½;
160			8: N½N½;
360			10: S½NE¼, S½SW¼, NE¼SW¼, SE¼;
40			18: SW¼ SE¼;
640			20: ALL
640			22: ALL
640			30: ALL
160			31: N½NE¼, SE¼NE¼, NE¼NW¼.
280	17	77	12: E½NE¼, SE¼NE¼, NW¼;
480			22: S½N½, S½;
320			24: N½;
360			34: N½N½, S½NE¼, N½SE¼, SE¼SE¼.
120	18	77	12: E½SE¼, SW¼SE¼;
320			14: E½E½, SW¼NE¼, SE¼NW¼, W½SE¼;
640			26: ALL.
80	19	77	32: S½SE¼.
160	20	77	2: W½E½.

Table A7-9. Lands Identified as Possibly Suitable for Disposal—Alternative 2—Carbon County

Acres	Township	Range	Section: Lot or Legal
200	18	78	24: SE¼NE¼, SE¼.
80	20	79	32: S½SE¼.
40	21	87	18: SW¼SW¼;

Acres	Township	Range	Section: Lot or Legal
80			26: S½SE¼;
640			32: ALL
640			34: ALL.
40	22	87	34: SE¼SE¼.
120	12	91	10: SE¼SW¼, S½SE¼;
160			13: W½NW¼, S½SW¼;
40			14: SW¼NW¼;
80			15: E½NE¼;
40			17: SW¼SW¼.
640	20	92	12: ALL.

Table A7-10. Lands Identified as Possibly Suitable for Disposal—Alternative 2—Sweetwater County

Acres	Township	Range	Section: Lot or Legal
240	20	94	34: W½W½NW¼, SE¼NW¼, SW¼.
600	20	95	32: N½, W½SW¼, SE¼SW¼, SE¼.

Lands Identified for Direct Sale to Towns for Community Expansion

Table A7-11. Lands Identified for Community Expansion—Alternative 2—Carbon County

Acres	Township	Range	Section: Lot or Legal	
240	17	83	8: N½S½, S½SE¼.	City of Saratoga
40	21	87	18: SW¼SW¼.	City of Rawlins

Table A7-12. Lands Identified for Community Expansion—Alternative 2—Sweetwater County

Acres	Township	Range	Section: Lot or Legal	
480	26	90	2: W½E½, W½;	
320			3: W½;	
160			10: NW¼;	
40			11: NW¼NE¼.	City of Bairoil
640	19	94	4: ALL	
160			24: SW¼.	City of Wamsutter

46,230 Total Acres (Alternative 2)

Alternative 3

No specific tracts of land would be considered for disposal under this alternative.

Alternative 4 (The Preferred Alternative)

The lands identified as possibly suitable for disposal under this alternative are the same as those identified in Alternative 2.

NOTE: See Disposal Criteria Appendix.

BUREAU OF RECLAMATION (BOR) WITHDRAWALS

Lands to be revoked and returned to Bureau of Land Management (BLM) jurisdiction are the same across all alternatives as follows:

Table A7-13. BOR Withdrawals—Seminoe Reservoir

Township and Range	Section: Lot or Legal	Acres
T. 23 N., R. 83 W		
	Section 30: E½NW¼.	80
T. 24 N., R. 83 W.		
	Section 16: SW¼;	160
	Section 18: NE¼NE¼;	40
	Section 22: E½SE¼;	80
	Section 30: NE¼NW¼;	40
T. 25 N., R. 83 W.		
	Section 30: E½SW¼, NW¼SW¼.	120
T. 23 N., R. 84 W.		
	Section 4: S½NW¼, N½SW¼;	160
	Section 10: NE¼NW¼;	40
	Section 14: SE¼NW¼;	40
	Section 16: NE¼NE¼;	40
	Section 22: SE¼SE¼;	40
	Section 24: NW¼SE¼;	40
	Section 26: E½SE¼, SE¼NW¼;	120
	Section 28: NW¼SW¼;	40
	Section 34: N½NE¼.	80
T. 24 N., R. 84 W.		
	Section 12: N½SE¼;	80
	Section 16: S½NW¼, SW¼NE¼, SW¼, W½SE¼;	360
	Section 18: S½SW¼;	80
	Section 36: NW¼NW¼.	40
T. 25 N., R. 84 W.		
	Section 9: NE¼NW¼;	40
	Section 10: N½SW¼.	80
T. 22 N., R. 85 W.		
	Section 2: NW¼NW¼.	40
T. 24 N., R. 85 W.		
	Section 14: NW¼.	160
6th P.M., Carbon County Wyoming *The Seminoe Reservoir Project BOR withdrawal—to be revoked and returned to BLM jurisdiction— encompasses 2,000 acres*		

Table A7-14. BOR Withdrawals—Savery-Pothook Project

Township and Range	Section: Lot or Legal
T. 13 N., R. 89 W.	
	Section 11: SE¼NW¼, NE¼SW¼, SW¼SW¼;
	Section 15: SW¼SE¼.
T. 14 N., R., 89 W.	
	Section 2: Lots 5, 6, 7 NE¼NW¼.
T, 15 N., R., 89 W.	
	Section 25: Lot 6;
	Section 35: Lots 1, 2, 3, 4, 5 SE¼NW¼, SW¼
T. 12 N., R. 90 W.	
	Section 19: Lots 1 and 2.

Township and Range	Section: Lot or Legal
T. 13 N., R. 91 W.	
	Section 34: Lot 1.
T. 12 N., R. 93 W.	
	Section 17: SW¼NE¼, S½NW¼, S½
	Section 18: SE¼SE¼
	Section 19: Lot 2
	Section 20: Lots 1 and 2
	Section 21: Lots 1 and 2.
6th P.M., Carbon County Wyoming *The Savery-Pothook Project BOR withdrawal—to be revoked and returned to BLM jurisdiction—encompasses 1,205 acres*	

LANDS CONSIDERED FOR ACQUISITION

Alternative 1 (The No Action Alternative)

Acquire easements to provide access to public lands for resource needs.

Consider nonfederal lands or interest in lands for acquisition to meet the objectives of the various resource management programs. Criteria for which lands would be acquired include in-holdings within Wilderness Study Areas (WSA), and some Surface Management Areas (SMA) and Herd Management Areas (HMA). See Land Exchange and Disposal Criteria Appendix.

Acquire state lands in Areas of Critical Environmental Concern (ACEC). See SMA Section and Land Exchange and Disposal Criteria Appendix for exchange criteria.

Acquire lands to manage the candidate plant species. See SMA Section and Land Exchange and Disposal Criteria Appendix for exchange criteria.

Alternative 2

Acquire easements to provide access to public lands for resource needs.

Consider nonfederal lands or interest in lands for acquisition to meet the objectives of the various resource management programs. Criteria for which lands would be acquired include in-holdings within WSAs, some SMAs and HMAs. See Land Exchange and Disposal Criteria Appendix.

Acquire state lands in ACECs. See SMA Section and Land Exchange and Disposal Criteria Appendix for exchange criteria.

Acquire lands to manage the candidate plant species. See SMA Section and Disposal Criteria Land Exchange and Disposal Criteria Appendix.

Alternative 3

Acquire easements to provide access to public lands for resource needs. No areas defined.

Consider nonfederal lands or interest in lands for acquisition to meet the objectives of the various resource management programs. Criteria for which lands would be acquired include in-holdings within WSAs, and some SMAs and HMAs. See Land Exchange and Disposal Criteria Appendix.

No Specific Tracts would be identified for acquisition.

Acquire state lands in ACECs. See SMA Section and Land Exchange and Disposal Criteria Appendix for exchange criteria.

Acquire lands to manage the candidate plant species. See SMA Section and Land Exchange and Disposal Criteria Appendix.

Alternative 4 (The Preferred Alternative)

Acquire easements to provide access to public lands for resource needs.

Consider nonfederal lands or interest in lands for acquisition to meet the objectives of the various resource management programs. Criteria for which lands would be acquired include in-holdings within WSAs, and some SMAs and HMAs. See Land Exchange and Disposal Criteria Appendix.

Acquire state lands in the ACEC. See SMA Section and Land Exchange and Disposal Criteria Appendix for exchange criteria.

Acquire lands to manage the candidate plant species. See SMA Section and Land Exchange and Disposal Criteria Appendix for exchange criteria.

Acquire state lands as they come available through purchase or exchange (preferably both surface and mineral to avoid split estate). See SMA Section for relevant action by alternative and Land Exchange and Disposal Criteria Appendix.

APPENDIX 8—MONITORING METHODS TO ASSESS WYOMING STANDARDS AND GUIDELINES FOR HEALTHY RANGELANDS

RANGELAND STANDARDS

The 1995 rangeland reform process modified the grazing regulations to address the fundamentals of rangeland health. In August 1997, the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the Bureau of Land Management in the State of Wyoming* were approved by the Wyoming State Director. The objectives of the rangeland health regulations are to "promote healthy sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions...and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands." The fundamentals of rangeland health combine the basic precepts or physical function and biological health with elements of law relating to water quality and plant and animal populations and communities. Initially, the standards focused on livestock grazing on Bureau of Land Management (BLM)-administered lands, but the standards were developed to apply to all uses and resources.

In the Rawlins Field Office, rangeland standards were assessed on an allotment basis from 1998 through 2000. However, allotment assessments tend to emphasize management and impacts from livestock grazing, rather than all uses that occur on and potentially impact public lands. In addition, assessing watersheds, water quality, and habitat for wildlife, fisheries, and Threatened and Endangered species, often does not correspond to allotment boundaries and is more logically evaluated on a larger scale. In January 2001, Instruction Memorandum (IM) No. 2001-079, Guidance for Conducting Watershed-Based Land Health Assessments, was sent to field offices from the Director of BLM. This IM transmitted the 4180 Manual Section and 4180-1 Rangeland Health Standards Handbook and provides guidance for conducting assessments and evaluations for ascertaining rangeland health on a watershed basis. Under Policy/Action, it states: "The Field Offices are to consider all assessment requirements for the watershed being assessed and select methods which will provide information needed to fulfill those requirements. When a field office invests its resources in an assessment, the end product should substantially meet all assessment needs to avoid conducting multiple assessments for multiple needs. For example, a well-planned, watershed-based assessment can provide the information needed for allotment evaluations, biological assessments for Section 7 Endangered Species Act consultation, and developing habitat management plans, Water Quality Improvement Plans for Total Maximum Daily Loads on impaired waters, and watershed restoration actions." In order to complete all Standard Assessments within the original 10-year time frame, watersheds have been divided into seven units, with the upper Colorado River watershed report being the first completed (see Map A8-1).

The standards are the basis for assessing and monitoring rangeland conditions and trends. The assessments are conducted by an interdisciplinary team with participation from permittees and other interested parties. Assessments are conducted only on BLM-administered public land; however, interpretation of watershed health and water quality may reflect on all land ownerships within the area of analysis. The following describes and explains the six standards.

Standard 1—Watershed Health

Within the potential of the ecological site (soil type, landform, climate, and geology), soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.

THIS MEANS THAT—

The hydrologic cycle will be supported by providing for water capture, storage, and sustained release. Adequate energy flow and nutrient cycling through the system will be achieved as optimal plant growth occurs. Plant communities are highly varied within Wyoming.

INDICATORS MAY INCLUDE, BUT ARE NOT LIMITED TO—

- Water infiltration rates
- Soil compaction
- Erosion (rills, gullies, pedestals, capping)
- Soil micro-organisms
- Vegetative cover (gully bottoms and slopes)
- Bare ground and litter.

These indicators are applied, as appropriate, to the potential of the ecological site. The standard is considered met if upland soil cover generally exceeds 30 percent, obvious signs of soil erosion are not apparent, and stream channels are stable and improving in morphology.

Standard 2—Riparian/Wetland Health

Riparian and wetland vegetation have structural, age, and species diversity characteristic of the state of channel succession and is resilient and capable of recovering from natural and human disturbance in order to provide forage and cover, capture sediment, dissipate energy, and provide for ground water recharge.

THIS MEANS THAT—

Wyoming has highly varied riparian and wetland systems on public lands. These systems vary from large rivers to small streams and from springs to large wet meadows. These systems are in various stages of natural cycles and may also reflect other disturbance that is either localized or widespread throughout the watershed. Riparian vegetation captures sediments and associated materials, thus enhancing the nutrient cycle by capturing and using nutrients that would otherwise move through a system unused.

INDICATORS MAY INCLUDE, BUT ARE NOT LIMITED TO—

- Erosion and deposition rate
- Channel morphology and flood plain function
- Channel succession and erosion cycle
- Vegetative cover
- Plant composition and diversity (species, age class, structure, successional stages, desired plant community, etc.)
- Bank stability
- Woody debris and instream cover
- Bare ground and litter.

These indicators are applied, as appropriate, to the potential of the ecological site. The standard is considered met if riparian/wetland habitat is rated in Proper Functioning Condition (PFC), and existing management will lead to maintaining or improving resource conditions.

Standard 3—Upland Vegetation Health

Upland vegetation on each ecological site consists of plant communities appropriate to the site, which are resilient, diverse, and able to recover from natural and human disturbance.

THIS MEANS THAT—

To maintain desirable conditions and/or recover from disturbance within acceptable time frames, plant communities must have the components present to support the nutrient cycle and adequate energy flow. Plants depend on nutrients in the soil and energy derived from sunlight. Nutrients stored in the soil are used over and over by plants, animals, and micro-organisms. The amount of nutrients available and the speed with which they cycle among plants, animals, and the soil are fundamental components of rangeland health. The amount, timing, and distribution of energy captured through photosynthesis are fundamental to the function of rangeland ecosystems.

INDICATORS MAY INCLUDE, BUT ARE NOT LIMITED TO—

- Vegetative cover
- Plant composition and diversity (species, age class, structure, successional stages, desired plant community, etc.)
- Bare ground and litter
- Erosion (rills, gullies, pedestals, capping)
- Water infiltration rates.

These indicators are applied, as appropriate, to the potential of the ecological site. The standard is considered met if plant communities are sustaining themselves under existing conditions and management.

Standard 4—Wildlife/Threatened and Endangered Species Habitat Health, Fisheries, Weeds

Rangelands are capable of sustaining viable populations and a diversity of native plant and animal species appropriate to the habitat. Habitats that support or could support threatened species, endangered species, species of special concern, or sensitive species will be maintained or enhanced.

THIS MEANS THAT—

The management of Wyoming rangelands will achieve or maintain adequate habitat conditions that support diverse plant and animal species. These may include listed threatened or endangered species (U.S. Fish and Wildlife-designated), species of special concern (BLM-designated), and other sensitive species (State of Wyoming-designated). The intent of this standard is to allow the listed species to recover and be delisted, and to avoid or prevent additional species becoming listed.

INDICATORS MAY INCLUDE, BUT ARE NOT LIMITED TO—

- Noxious weeds
- Species diversity

- Age class distribution
- All indicators associated with the upland and riparian standards
- Population trends
- Habitat fragmentation.

The above indicators are applied as appropriate to the potential of the ecological site. The standard is considered met if habitat needed to support wildlife species is being sustained under existing conditions and management.

Standard 5—Water Quality

Water quality meets Wyoming standards.

THIS MEANS THAT:

The State of Wyoming is authorized to administer the Clean Water Act. BLM management actions or use authorizations will comply with all federal and state water quality laws, rules, and regulations to address water quality issues that originate on public lands. Provisions for the establishment of water quality standards are included in the Clean Water Act, as amended, and the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the Code of Federal Regulations and in Wyoming's Water Quality Rules and Regulations. The latter regulations contain Quality Standards for Wyoming Surface Waters. Natural processes and human actions influence the chemical, physical, and biological characteristics of water. Water quality varies from place to place with the seasons, the climate, and the kind substrate through which water moves. Therefore, the assessment of water quality takes these factors into account.

INDICATORS MAY INCLUDE, BUT ARE NOT LIMITED TO—

- Chemical characteristics (e.g., pH, conductivity, dissolved oxygen)
- Physical characteristics (e.g., sediment, temperature, color)
- Biological characteristics (e.g., macro- and micro-invertebrates, fecal coliform, and plant and animal species).

The standard is considered unknown unless information provided by the State of Wyoming determines the status of a water body as impaired (not meeting) or is meeting its beneficial uses.

Standard 6—Air Quality

Air quality meets Wyoming standards.

THIS MEANS THAT—

The State of Wyoming is authorized to administer the Clean Air Act. BLM management actions or use authorizations will comply with all Federal and State air quality laws, rules, regulations and standards. Provisions for the establishment of air quality standards are included in the Clean Air Act, as amended, and the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the Code of Federal Regulations and in Wyoming Air Quality Standards and Regulations.

The standard is considered met or impaired based on information provided by the State of Wyoming.

If an assessment shows that a standard(s) is not being met, factors contributing to the nonattainment are identified and management recommendations developed so the standard may be attained. If livestock are contributing to the nonattainment of a standard, as soon as practical but no later than the start of the next grazing season, management practices must be implemented to ensure that progress is being made toward attainment of the standard(s). The rangeland standards establish a threshold; however, the desired future condition of resource values will usually be at a higher level than the threshold.

The desired future condition portrays the land or resource values that would exist in the future if management goals were achieved. The length of time to achieve the desired future condition would vary depending on the resources involved, the management actions required, and the speed at which different resources can effectively change. For instance, improving plant cover and litter, or changing species composition with treatments, may be achieved relatively quickly (5 to 10 years). However, developing a mixed age structure of willows along a stream by changing livestock management may take 20 to 30 years, even though the area it may be properly functioning. Other actions, such as restoring aspen woodland within lodgepole pine forest communities using prescribed or natural fire, may take 50 years or more.

The framework for the watershed-based assessment and report follows the "Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis—Version 2.2." The format contains an introduction and background information, followed by discussion of each rangeland standard in the order described earlier in this document. Within the discussion for each standard is a map and description of how the standard is addressed. The outline of discussion for each standard follows the six-step process for ecosystem analysis at the watershed scale. The six steps are: 1) characterization of the watershed, 2) identification of issues and key questions, 3) description of current conditions, 4) description of reference conditions, 5) synthesis and interpretation of information, and 6) recommendations. Core topics are discussed under the appropriate standard, with erosion processes, hydrology, and stream channels under Standard 1; vegetation split into wetland/riparian or upland under Standards 2 and 3; species and habitats under Standard 4; and water quality under Standard 5. Human uses are discussed under each standard where appropriate.

Watershed-based assessments and reports are expected to have long-lasting results. Based on communication and coordination with permittees, local government, and affected interests, these reports provide historical perspective and a point in time analysis of the "big picture." These reports will be useful to look back on when future assessments in the same area are completed. They also identify problems that require correction or improvement that result from not only grazing, but other sources that impact public lands that in the past were often not addressed. Areas of concern or management issues identified in these reports will help identify future priorities for budget requests, project planning, and monitoring.

MONITORING

Monitoring is the collection of data along with professional observations used in evaluating rangeland health to determine whether standards are being met. Common elements of monitoring include climate information, animal numbers and use periods, animal diet and/or plant use data, and trends (changes over time) in other important values. These may be related to plant health, watershed cover, stream channel shape, water flow and quality, macroinvertebrates, insects, wildlife populations, etc. One-time evaluations, such as assessment of the proper functioning condition of riparian habitat, are not considered monitoring. The following descriptions further explain some of the types of data commonly collected and used in the evaluation process:

- **Rain Gages:** Climate data primarily consists of precipitation information from the National Weather Service and BLM stations around the RMPPA. These allow analysis of the amount and timing of moisture compared with water availability and forage production observed in the field.

- **Animal Numbers and Use Periods:** Animal numbers are obtained from permittees for livestock, from the WGFD for big game herd units, and from BLM counts for wild horses. Use periods and/or distribution of use are determined from a combination of permittee information and field observations for livestock, and primarily from field observations for big game, other wildlife use, and wild horses.

- **Animal Diet/Plant Utilization:** This information is used to determine what types and quantities of plants are being eaten, as well as the changes in selection through different seasons. Animal diet is usually obtained by fecal analysis or field observations, while plant utilization is always measured or observed through field visits.

- **Upland Cover:** This information refers either to soil cover or vegetation cover, or both. It is determined by reading transects and/or plots. Soil cover information usually includes plant cover, litter, fecal matter, cryptograms, rocks, and bare ground. Plant species composition, plant spacing, or other data may also be collected. Vegetation cover information is often data about plants and may include cover, density, height, and, for shrubs and trees, age and hedge class information, all usually by individual plant species. This information is used to evaluate what the upland range condition is and whether the proper plant species are able to sustain healthy range condition.

- **Riparian Cross-Sections:** This information is used to record changes in the channel geometry and the riparian stability. Cross-sections of riparian areas are surveyed with a surveying level and rod to assess changes in channel shape. These monitoring techniques are designed to assess changes in stream channel width and depth, side channel modifications, sloughing of banks, and other changes in the riparian micro-topography.

- **Photo Points:** Photo points are usually permanent points, marked with steel posts, angle irons, or rock piles, where photographs are retaken to show change in vegetation, stream channels, or some other landscape features. There are between 2,000 and 3,000 such points, located in grasslands, shrublands, riparian, aspen, and juniper range types. Depending on the management objectives and priority, they are revisited every 2 to 10 years. They are often found in association with other monitoring studies.

- **Monitoring Wells:** To assess the depth to saturation in the soil of riparian areas, the range staff has established shallow monitoring wells (peizometers) at different riparian areas in the RMPPA. These help to determine the effects of grazing animals on soil compaction, porosity and permeability, and whether water is within the rooting zone of riparian plants. There are approximately 20 monitoring wells in the RMPPA, which are read every 2–3 years.

- **Stream Gaging Stations:** Stream gages are operated and maintained on larger drainages by the U.S. Geological Survey on a permanent basis. Other entities, like the BLM, Conservation Districts, and the University of Wyoming will alone or cooperatively set up stream gages on smaller drainages for special projects to collect more information or monitor changes in management. Gages are currently in place along Muddy Creek and Sage Creek for this purpose. This usually involves documentation of amount and timing of flows, and may include various qualitative parameters such as turbidity, pH, dissolved oxygen, and sediment load.

- **Wildlife Species Activity and Counts:** Special status species may have more attention focused upon them, such as Greater sage-grouse and mountain plover. Use areas, number of birds, and

concentration areas are documented and used in future management decisions. In some cases it may be a unique or important habitat (i.e., riparian). In the George Dew and Red Wash areas along Muddy Creek, the species and timing of birds using the improved or created wetland/riparian habitat is being documented to show the benefits of such activities, as well as any possible adverse impacts to native fish.

- **Macroinvertebrates:** The State of Wyoming (Wyoming Department of Environmental Quality) has developed a protocol for water quality assessments that includes monitoring of macroinvertebrates. Local conservation districts help to collect this information as a tool to define priority areas for work and to monitor results. This often includes public lands as well as private and state lands, with data gathered shared with the affected interests. This is much less expensive and may show results faster than simply using more stream gaging stations.

APPENDIX 9—EXCEPTION AND WAIVER CRITERIA

PROCEDURES FOR HANDLING REQUESTS FOR EXCEPTION FROM SEASONAL STIPULATIONS AND/OR CONDITIONS OF APPROVAL

The Wyoming Fish and Game Department (WFGD) has authority to set standards for exceptions and waivers to ensure that requests do not jeopardize wildlife populations. Therefore, the BLM will process request for exception and waiver in coordination with WGFD. A request for exception must be initiated in writing by the operator near the time that the work is proposed to be completed. The unpredictability of weather, animal movement and condition, etc., precludes analysis of requests related to wildlife far in advance of the time periods in question. Analyses of a request include review of potential mitigation measures and alternatives (traffic restrictions, alternative scheduling, staged activity, etc.). The request is considered as a unique action and is analyzed and documented individually for Resource Management Plan (RMP) and National Environmental Policy Act (NEPA) compliance. Processing includes coordination with the Wyoming and Game and Fish Department (WGFD) for seasonal wildlife-based lease stipulations or permit Conditions of Approval (COA).

CRITERIA FOR CONSIDERING EXCEPTIONS TO SEASONAL RESTRICTED ACTIVITY

Presently, land use activities within the Resource Management Plan Planning Area (RMPPA) may be authorized with a seasonal restriction(s), "no surface occupancy," or a distance restriction for sensitive and crucial habitats. Stipulations were developed to provide protection of natural resources. Protective wildlife seasonal stipulations are developed consistent with statewide dates. For example, big game crucial winter ranges are protected from November 15 through April 30. This restriction is not intended to close an area to development but is in place to protect big game if weather or other habitat needs dictate that it is necessary.

Over the past few years, the public has received the impression that crucial winter ranges are off limits to any activity. This is true only when conditions dictate. The Bureau of Land Management (BLM) can and does grant exceptions to seasonal restrictions if BLM, in consultation with the WGFD, feels that granting an exception would not jeopardize the wildlife population being protected. BLM uses a set of criteria when considering a request for an exception. Professional judgment plays a key part in BLM's decision to grant or not grant exception(s). There is no clear-cut formula.

Approximately 3,686,020 acres of federal land in the resource area currently has some type of lease stipulation. The following section describes some of the factors considered by BLM in determining whether a request for exception should be granted.

Big Game Winter Ranges

The criteria used for crucial big game winter range are based on the area available, whether that area is relatively intact, and whether it has a history of wintering most of the population at adequate body conditions for 8 or more years out of 10. The most crucial time period in the RMPPA is usually from January 1 through March 15, and during this period, the restrictions are generally enforced. However, during the remaining time in the standard statewide stipulation the authorizing officer is allowed the option to enforce a longer seasonal restriction if winter conditions warrant.

General Considerations for Granting Exceptions to Stipulations

Elk

- Short-term exceptions are more likely to be considered early (November 15–December 1) and late (April 1–30) in the winter season, depending on weather conditions and animal occupancy. Exceptions would not be granted if requested from December 1–March 1 unless unusually mild winter conditions prevail. Exceptions to stipulated elk calving areas' dates (May 1–June 30) will not be granted because of elk sensitivity to disturbance. Displacement in open habitats is much greater than in woodlots or forests, hence restricted areas will encompass larger areas in open habitat. Exceptions can be granted for north slopes, deep snow areas, or other habitats within crucial ranges that preclude use by wintering elk and in which access roads are determined to have little adverse impact.

Moose

- Exceptions will depend on weather conditions and presence of animals.
- Moose habitat is given protection through riparian and stream buffer zone stipulations (500 feet from live water and riparian habitats).

Antelope

- Exceptions may be granted except where physical barriers (i.e., highways, fences, rivers. canyons, etc.) limit animals' ability to move into other suitable habitats. Short-term exceptions may be granted early (November 15–December 1) and late (April 1–30) depending on weather conditions and animal occupancy. Exceptions would not be granted if requested from December 1–March 1 unless unusually mild winter conditions prevailed. Exceptions can be granted for north slopes, deep snow areas, or other habitats within crucial ranges that preclude use by wintering deer and in which access roads are determined to have little adverse impact.

Deer

- Short-term exceptions may be granted early (November 15–December 1) and late (April 1–30) depending on weather conditions and animal occupancy. Exceptions would not be granted if requested from December 1–March 1 unless unusually mild winter conditions prevail. Exceptions can be granted for north slopes, deep snow areas or other habitats within crucial ranges that preclude use by wintering deer and in which access roads are determined to have little adverse impact.

Raptors

- The "no surface occupancy" stipulation of February 1–July 31, within ½ or 1 mile of raptor nests can be shortened, depending on nesting chronology of individual species, nest site location, and topography. Certain types of short-term, minor disruptive land use activities that are not anticipated to affect nesting success may be granted.

Columbian Sharp-tailed and Greater Sage-Grouse

- A "controlled surface use" stipulation will be applied to a ½-mile radius of active sage-grouse strutting grounds, including no aboveground facilities (power lines. storage tanks, fences, etc.). Exceptions could be granted for disturbances such as low-traffic roads, pipelines, seismic activity,

etc. A controlled surface use stipulation will be applied March 1–May 20, within a ½-mile radius of active strutting grounds from 6 p.m. to 9 a.m. daily. Weather conditions, such as fog and cloudy conditions or clear, bright moonlit nights, can result in modification of the actual timing of this stipulation. Seasonal restrictions would be applied within a 3/4-mile radius of leks to protect sage-grouse nesting habitat. Exceptions can be granted for areas within that radius not used for nesting, provided actual nesting areas are not affected. These time and date stipulations reflect recommendations from WGFD based on site-specific data for the RMPPA.

The following information would be considered regarding possible exceptions to stipulations protecting Columbian sharp-tailed and Greater sage-grouse during sensitive life cycles.

BLM would consider, but is not limited to, the following information in determining exceptions for projects located in the vicinity of leks:

- Presence of early lek activity (activity outside stipulated timing restrictions)
- Lek has been active in the past few years
- Location of proposed activity
- Duration of proposed project
- Possible geographic feature that would shield activity from lek activity (depending on topography and activity type).

BLM would consider, but is not limited to, the following information in determining exceptions for projects located in the vicinity of nesting activity:

- Nesting habitat is present
- Location of proposed project
- Duration of proposed project
- Possible geographic feature that would shield activity from nesting activity (depending on topography and activity type).

The final determination for granting an exception to wildlife stipulations will be a decision by BLM after consultation with the WGFD.

These procedures will be used for any request for exception for a surface-disturbing activity.

MODIFICATION OR WAIVER OF LEASE TERMS OR STIPULATIONS

"A stipulation included in an oil and gas lease shall be subject to modification or waiver only if the authorized officer determines that the factors leading to its inclusion in the lease have changed sufficiently to make the protection provided by the stipulation no longer justified or if proposed operations would not cause unacceptable impacts. If the authorized officer has determined, prior to lease issuance, that a stipulation involves an issue of major concern to the public, modification or waiver of the stipulation shall be subject to public review for at least a 30 day period. In such cases, the stipulation shall indicate that public review is required before modification or waiver. If subsequent to lease issuance the authorized officer determines that a modification or waiver of a lease term or stipulation is substantial, the modification or waiver shall be subject to public review for at least a 30-day period." (43 CFR 3101.1-4)

The modification or waiver of an oil and gas lease term implies that the sensitive resource for which the protective measure was considered is in some way not present in the area or in some way is no longer in need of the protective measure. In either case, consideration of a modification or waiver of a lease stipulation would require environmental analysis and may result in an amendment to the land use plan.

APPENDIX 10—SPECIAL STATUS SPECIES LIST

ANIMALS

Threatened and Endangered Species

Updated August 27, 2003

Table A10-1. Threatened and Endangered and Candidate Animal Species in the Rawlins RMPPA

Species	Status	Expected Occurrence
Bald Eagle *(Haliaeetus leucocephalus)*	Threatened	Nesting, winter resident, migrant
Western Yellow-billed Cuckoo *(Coccyzus americanus)*	Threatened	Deciduous-riparian woodland ecosystems
Canada Lynx *(Lynx canadensis)*	Threatened	Resident of forested areas
Black-footed Ferret *(Mustela nigripes)*	Endangered	Potential resident in prairie dog towns
Blacktailed Prairie Dog *(Cynomys ludovicianus)*	Candidate	Open grassy plains and upland areas
Preble's Meadow Jumping Mouse *(Zapus hudsoniuse preblei)*	Threatened	Riparian habitats east of Laramie Mountains and south of the North Platte River
Wyoming Toad *(Bufo baxteri)*	Endangered	Resident of Laramie River Valley
Western Boreal Toad *(Bufo boreas boreas)*	Candidate	Wet and dry meadows of the Upper Muddy Creek and Powder Rim areas

If a proposed action will lead to water depletion (consumption) in the Platte or Colorado River systems, impacts to the following species should be included in the evaluation:

Table A10-2. Threatened and Endangered Animal Species Downstream of the Rawlins RMPPA

Species	Status	Expected Occurrence
Interior Least Tern *(Sterna antillarium)*	Endangered	Downstream resident of the Platte River
Interior Piping Plover *(Charadrium melodus)*	Threatened	Downstream resident of the Platte River
Pallid Sturgeon *(Scaphirhynchus albus)*	Endangered	Downstream resident of the Platte River
Whooping Crane *(Grus americana)*	Endangered	Downstream resident of the Platte River
Eskimo Curlew *(Numenius borealis)*	Endangered	Downstream resident of the Platte River
Bonytail Chub *(Gila elegans)*	Endangered	Downstream resident of the Colorado River
Colorado Pikeminnow *(Ptychocheilus lucius)*	Endangered	Downstream resident of the Colorado River
Humpback Chub *(Gila cypha)*	Endangered	Downstream resident of the Colorado River
Razorback sucker *(Xyrauchen texanus)*	Endangered	Downstream resident of the Colorado River

BLM Sensitive Species

Table A10-3. BLM Sensitive Animals in the Rawlins RMPPA

Sensitive Species Common Name	Scientific Name	Habitat
Mammals		
Myotis, Long-eared	*Myotis evotis*	Conifer and deciduous forests, caves and mines
Myotis, Fringed	*Myotis thysanodes*	Conifer forests, woodland-chaparral, caves and mines
Bat, Townsend's Big-eared	*Corynorhinus townsendii*	Forests, basin-prairie shrub, caves and mines
Prairie Dog, White-tailed	*Cynomys leucurus*	Basin-prairie and riparian shrub
Pocket Gopher, Wyoming	*Thomomys clusius*	Meadows with loose soil
Fox, Swift	*Vulpes velox*	Grasslands
Birds		
Ibis, White-faced	*Plegadis chihi*	Marshes, wet meadows
Swan, Trumpeter	*Cygnus buccinator*	Lakes, ponds, rivers
Goshawk, Northern	*Accipter gentilis*	Conifer and deciduous forests
Hawk, Ferruginous	*Buteo regalis*	Basin-prairie shrub, grasslands, rock outcrops
Falcon, Peregrine	*Falco peregrinus*	Tall cliffs
Sage-grouse, Greater	*Centrocercus urophasianus*	Basin-prairie shrub, mountain-foothill shrub
Grouse, Columbian Sharp-tailed	*Tympanuchus phasianellus columbianus*	Grasslands
Curlew, Long-billed	*Numenius americanus*	Grasslands, plains, foothills, wet meadows
Cuckoo, Yellow-billed	*Coccyzus americanus*	Open woodlands, streamside willow and alder groves
Owl, Burrowing	*Athene cunicularia*	Grasslands, basin-prairie shrub
Thrasher, Sage	*Oreoscoptes montanus*	Basin-prairie shrub, mountain-foothill shrub
Shrike, Loggerhead	*Lanius ludovicianus*	Basin-prairie shrub, mountain-foothill shrub
Sparrow, Brewer's	*Spizella breweri*	Basin-prairie shrub
Sparrow, Sage	*Amphispiza belli*	Basin-prairie shrub, mountain-foothill shrub
Sparrow, Baird's	*Ammodramus Bairdii*	Grasslands, weedy fields
Fish		
Chub, Roundtail	*Gila robusta*	Colorado River drainage, mostly large rivers, also streams and lakes
Chub, Leatherside	*Gila copei*	Bear, Snake and Green river drainages, clear, cool streams and pools
Sucker, Bluehead	*Catostomus discobolus*	Bear, Snake and Green drainages, all waters
Sucker, Flannelmouth	*Catostomus latipinnis*	Colorado River drainage, large rivers, streams and lakes
Trout, Colorado River Cutthroat	*Oncorhynchus clarki pleuriticus*	Colorado River drainage, clear mountain streams
Amphibians		
Frog, Northern Leopard	*Rana pipiens*	Beaver ponds, permanent water in plains and foothills
Spadefoot, Great Basin	*Spea intermontana*	Spring seeps, permanent and temporary waters

Sensitive Species Common Name	Scientific Name	Habitat
Toad, Boreal (Northern Rocky Mountain population)	*Bufo boreas boreas*	Pond margins, wet meadows, riparian areas
BLM Wyoming Sensitive Species List, September 20, 2002.		

PLANTS

Threatened and Endangered Species

Table A10-4. Threatened and Endangered Plant Species in the Rawlins RMPPA

Common Name	Scientific Name	Status	Habitat
Blowout Penstemon	*Penstemon haydenii*	Endangered	Open sandy habitat of blowouts
Ute Ladies' Tresses	*Spiranthes diluvialis*	Threatened	Seasonally moist soils and wet meadows of drainages below 7,000 feet
Colorado Butterfly Plant	*Gaura neomexicana* ssp. *coloradensis*	Threatened	Moist areas of floodplains in a small area of southeastern Wyoming, western Nebraska, and north-central Colorado

If a proposed action will lead to water depletion (consumption) in the Platte or Colorado River systems, impacts to the following species should be included in the evaluation:

Table A10-5. Threatened and Endangered Plant Species Downstream of the Rawlins RMPPA

Common Name	Scientific Name	Status	Habitat
Western Prairie Fringed Orchid	*Platanthera praeclara*	Threatened	Riparian area—Platte River watershed.

BLM Sensitive Species

Table A10-6. BLM Sensitive Plants in the Rawlins RMPPA

Sensitive Species Common Name	Scientific Name	Habitat
Laramie Columbine	*Aquilegia laramiensis*	Crevices of granite boulders and cliffs, at 6,400–8,000 feet
Nelson's Milkvetch	*Astragalus nelsonianus – or-Astragalus pectinatus var. platyphylius*	Alkaline clay flats, shale bluffs and gullies, pebbly slopes, in sparsely vegetated sagebrush, juniper, and cushion plant communities; at 5,200–7,600 feet
Cedar Rim Thistle	*Cirsium aridum*	Barren, chalky hills, gravelly slopes and fine-textured sand-shaley draws; at 6,700–7,200 feet
Weber's Scarlet Gilia	*Ipomopsis aggregata ssp. weberi*	Openings in coniferous forests and scrub oak woodlands, at 8,500-9,600 feet
Gibbens Beardstongue	*Penstomon gibbensii*	Sparsely vegetated shale or sandy-clay slopes, at 5,500–7,400 feet
Persistent Sepal Yellowcress	*Rorippa calycina*	Riverbanks and shorelines on sandy soils near the high-water line

Sensitive Species Common Name	Scientific Name	Habitat
Pale Blue-eyed Grass	*Sisyrinchium pallidum*	Wet meadows, stream banks, roadside ditches, and irrigated meadows; at 7,000–7,900 feet
Laramie False Sagebrush	*Sphaeromeria simplex*	Cushion plant communities on rocky limestone ridges and gentle slopes, at 7,500–8,600 feet

APPENDIX 11—WATER QUALITY WITHIN THE RMPPA AND RIVER SYSTEM DEPLETIONS

The State of Wyoming recently issued a summary report for threatened or impaired water bodies, below are excerpts and summaries for areas within the Rawlins Field Office (RFO) (Wyoming 2003). This assessment was done to meet requirements of Section 305(b) and 303(d) of the Clean Water Act. Wyoming uses a publicly reviewed methodology to prepare the document, which meets the requirements of the "credible data" law. To see the current list of water bodies in the Resource Management Plan Planning Area (RMPPA) on the threatened or impaired list in this draft report (see Table A11-1).

DESCRIPTION OF SUB-BASINS IN THE RFO

This section draws heavily from the Wyoming description of these basins (Wyoming 2003) and also contains local information from the Rawlins BLM on conditions and management practices that reflect current conditions. The reader should be aware that these descriptions are as current as possible for 2004 and most likely will not be accurate for the future. These are presented to give the reader an impression of typical water quality conditions in the RMPPA.

Muddy Creek Sub-basin (HUC 14050004)

Muddy Creek below Littlefield Creek and McKinney Creek below Eagle Creek are listed on Table C of the 303(d) List because of threats from physical degradation of the stream channels and riparian areas (See Table A11-1). The Little Snake River Conservation District (LSRCD) has had several 319 watershed improvement projects in the Upper Muddy Creek drainage to address those threats. The RFO has participated in these projects by working with permittees to address grazing management issues and vegetation management on BLM lands.

Implementation measures include upland water development, cross-fencing, vegetation management, and grazing management. These projects resulted in considerable improvement to stream stability, aquatic habitat, and riparian areas. As a result, Muddy Creek and Littlefield Creek above their confluence and McKinney Creek above Eagle Creek are now meeting their aquatic life uses. Because of the improved water quality, Colorado River Cutthroat Trout have been reintroduced into their former habitat in Littlefield Creek.

McKinney Creek and portions of Muddy Creek are still being monitored in cooperation with the LSRCD and grazing practices are being evaluated to improve these reaches. McKinney Creek still lacks the woody component in the riparian area, has too many bare banks, needs improvement in the width/depth ratios, and the season of use on the herbaceous component of these systems is too long. Efforts will continue to be made to improve the ecological health of these systems.

Another project was implemented on the reach of Muddy Creek, lying west of Highway 789, to address physical degradation of the stream channel, which threatens its aquatic life use support. This reach of Muddy Creek is also on Table C of the 303(d) List. Implementation measures include wetland development, floodplain reestablishment, and irrigation water management. Results of this project show an improving trend in riparian condition and bank stability above Red Wash. However, habitat degradation has been identified by the BLM and LSRCD as a serious water quality concern on Muddy Creek, from Red Wash downstream to the Little Snake River. The habitat degradation is likely caused by season-long riparian grazing, exacerbated by accelerated erosion associated with oil and gas activities.

Several grazing best management practices (BMPs) are being implemented in much of this lower watershed, including changes in length, timing, and duration of grazing and cross-fencing. However, projected increases in Coalbed Natural Gas development will lead to increased surface disturbance and possible increased erosion and sediment loading.

Little Snake Sub-basin (HUC 14050003)

Haggarty Creek is the site of an inactive copper mine, the Ferris-Haggarty/Osceola Tunnel, which dates from 1898. Haggarty Creek originates near the Continental Divide and confluences with Lost Creek to form West Fork Battle Creek. Haggarty Creek has been on former 303(d) lists because of metal exceedences (primarily copper with less toxic amounts of silver and cadmium) discharging from the Ferris-Haggarty Mine. The Department of Environmental Quality-Abandoned Mine Lands (AML) Program has funded a remediation project to treat the effluent and a proposed total maximum daily load (TMDL) has been sent to the Environmental Protection Agency (EPA). Review of data during the TMDL process on Haggarty Creek revealed that copper criteria are also exceeded on the West Fork of Battle Creek, downstream of Haggarty Creek, so this stream was added to Table A of the 303(d) List. The treatment of the Ferris-Haggarty/Osceola Tunnel effluent is thought to be more than adequate to allow the West Fork of Battle Creek to meet standards.

The Department of Environmental Quality (DEQ) has monitored water quality in the Little Snake watershed, which indicates that aquatic life uses are fully supported on the portions of the Savery Creek and North Fork Little Snake drainages within the Medicine Bow National Forest and much of the upper watershed of Little Savery Creek. However, physical degradation of lower Savery Creek and West Loco Creek is threatening full aquatic life use support, and these streams are on Table C of the 303(d) List. Currently, a 319 watershed improvement project is in place in the lower Savery Creek drainage to address those threats.

Upper North Platte Sub-basin (HUC 10180002)

The Upper North Platte Sub-basin is that area upstream of Seminoe Reservoir to the Colorado Line. In the upper portion of this sub-basin, like most of the high-elevation basins in Wyoming, most of the bottomlands are privately owned and irrigated for hay production. Generally, the uplands are grazed at lower elevations primarily early and late in the year, and the higher elevations are grazed in the summer. Much of the forested area was historically harvested for railroad ties, and many of the larger mountain streams were straightened and logs and boulders were removed to facilitate tie driving. There is some oil and gas production in the sub-basin, and Sinclair has an oil refinery. There are no large-scale mining operations, but historically there has been considerable gold and copper mining in both the Sierra Madre and Medicine Bow mountains. DEQ's Abandoned Mine Lands Division (AML) has funded restoration projects in many of the mining areas within the sub-basin.

Iron oxide was mined near Rawlins for use primarily as a paint pigment and has been applied on barns across the country. There has also been some limited coal mining in this basin, and gravel mines are scattered throughout.

Stream bank modification within the town limits of Saratoga, intended to reduce erosion, resulted in increased erosion in several other places as the river adjusted its channel. However, recent stabilization has been conducted with natural river processes in mind, which should reduce erosion. Natural hot springs in and near Saratoga slightly increase the temperature and dissolved solids content of the river.

Encampment River Watershed (HUC 1018000205)

The Encampment River originates in the Mt. Zirkel Wilderness area in Colorado before it flows into Wyoming. Within a couple miles it flows into the Encampment River Wilderness Area. Flows are augmented in this drainage as a result of a trans-basin diversion of water from the Little Snake drainage into Hog Park Reservoir for replenishing the North Platte water that Cheyenne diverts out of Douglas Creek. The increased flows in Hog Park Creek did reportedly cause some initial channel adjustment after the reservoir was completed in 1965, but the stream appears to be stabilizing. South Hog Park Creek was tie driven and carried a large sediment load and was unstable, so tree revetments were installed to help the stream establish a more natural shape and to improve the fishery. But beaver were removing the revetments for dam building because dams built with the small available willows could not withstand high spring runoff. Aspens are now being cut and hauled to the beaver so they will use the aspens instead of the revetments, so both can work to trap the sediment and restore the stream.

A diversion ditch in the Billie Creek drainage breached in the late 1990s, eroded a gully and deposited approximately 3,300 tons of sediment in Billie Creek and its flood plain. Restoration work of the gully was completed in 2001 to curtail erosion; however, recovery from the impacts to the stream and its aquatic life will likely take several years.

A 1984–86 AML remediation project removed a large (approximately 65,000 cubic yards) tailings pile generated by the mill and smelter in Encampment during the early 1900s, which reportedly resulted in considerable water quality improvement in the river. DEQ has conducted extensive monitoring in the drainage, and the majority of the stream miles are fully supporting their aquatic life uses.

Sage Creek Watershed (HUC 1018000209)

Sage Creek has a naturally high sediment load because of the highly erosive soils and arid climate in much of the watershed. It has been identified by several studies as the most significant contributor of sediment to the Upper North Platte River and is on Table C of the 303(d) List. In addition, dam failures, road building, and past grazing practices have resulted in increased erosion and sediment loading, especially from the lower portion of the watershed. In 1997, Saratoga-Encampment-Rawlins Conservation District (SERCD), in cooperation with landowners, BLM, the Natural Resources Conservation Service (NRCS), and the Wyoming Game and Fish Department (WGFD), began the Sage Creek Watershed 319 project.

The project is using a combination of short-duration grazing, off-channel water development, improved road management, grade control structures and water diversion and vegetation filtering to reduce sediment loading from Sage Creek to the North Platte, as well as improving water quality within Sage Creek. Data collected as part of the project already show reduced sediment loading to the North Platte River and improved riparian and range condition.

Hugus and Iron Springs Draw drainages are Class 3B waters, with intermittent to ephemeral stream channels. Although historically impacted by past grazing practices, existing information and data indicate no significant water quality problems. In addition, new and developing Allotment Management Plans (AMPs) are expected to result in even better watershed condition. Sugar Creek flows through Rawlins and enters the North Platte just upstream of Seminoe Reservoir. Some concerns with the physical condition of the watershed above Rawlins have been raised. Rawlins' wastewater treatment plant discharges to Sugar Creek, but the stream rarely flows all the way to its confluence with the North Platte River.

Pathfinder-Seminoe Sub-basin (HUC 10180003)

In the Pathfinder-Seminoe Sub-basin, North Platte River flow is regulated by Seminoe, Kortes, and Pathfinder Reservoirs. The sub-basin includes those areas, other than the Sweetwater and Medicine Bow Rivers, which drain into the North Platte River, or its reservoirs, between Pathfinder dam and the head of Seminoe Reservoir. Primary land uses in this sub-basin are ranching, irrigated hay production, coal mining and recreation. Underground coal mining began in the Hanna-Elmo area in the late 1860s to supply fuel for the transcontinental railroad and resulted in extensive underground coal workings created over a period of years. AML completed three remediation projects in the Hanna area, which corrected the erosion and standing water impacts associated with coal slag piles and almost 200 coal mine-related subsidence holes. Current coal mining activities are thought to have little impact on the water quality in this sub-basin or the Medicine Bow Sub-basin (HUC 10180004).

Pathfinder dam was completed in 1909 and provided the first regulation of flows on the river. Reservoirs also trap sediment and lower average water temperature, so the natural flow characteristics of the North Platte have not existed since then. An extremely productive tailwater fishery resulted after Seminoe Dam was completed in 1939 and was given the name Miracle Mile. Completion of Kortes Reservoir below Seminoe Dam shortened the Miracle Mile area, but with the establishment of instream flow rights, it is still considered a premiere blue ribbon fishery.

Deweese Creek, which flows into Pathfinder Reservoir, is one of the few perennial streams in this sub-basin and is considered a reference stream for sand bottom streams in the Wyoming Basin Ecoregion.

Medicine Bow Sub-basin (HUC 10180004)

The headwaters of the Medicine Bow Sub-basin are on the north slope of the Snowy Range. Water quality characteristics change drastically as the streams flow from the metamorphic geology of the mountains through the easily erodible, fine-grained sedimentary geology of the basin. This sub-basin drains into Seminoe Reservoir. Land uses include logging in the mountains, grazing, irrigated hay production, recreation, coal mining, and oil and gas development. Irrigation in the Medicine Bow River drainage (including Rock Creek) dates to at least 1870–1880, the time of railroad construction. The transcontinental railroad reached this area in 1868, and coal production began in 1869 near Carbon to supply fuel for the railroad.

AML has completed 10 site investigations in this sub-basin, most related to coal and gravel production, and completed remediation of one early 1900s coal mine. Water quality assessments conducted in the upper Medicine Bow River drainage above the town of Elk Mountain indicate full support of aquatic life uses. Extensive monitoring by DEQ, as well as several agencies and universities, also indicate full aquatic life use support in the Rock Creek drainage above McFadden. The Medicine Bow Conservation District has conducted considerable monitoring in the lower portion of this sub-basin, and the final data interpretation is pending.

Little Medicine Bow Sub-basin (HUC 10180005)

The Little Medicine Bow Sub-basin drains the northwestern edge of the Laramie Mountains and the Shirley Basin. Land uses are primarily ranching and oil and gas development, together with historic uranium mining (1955 to the early 1980s). AML completed reclamation of about 1,650 acres of open pit uranium mines in Shirley Basin.

The Little Medicine Bow River originally flowed through the uranium ore location. During mining operations in 1972, the river was diverted to the east and shortened. The unstable new channel had down cut as much as 50 feet and drastically increased the sediment input to the drainage system. During reclamation, the river channel was restored to its former location and pre-mining condition, with stabilized, revegetated banks and a revegetated riparian area. Eroding radioactive mine waste piles, which also contained elevated levels of selenium and heavy metals, were removed. Leaching and runoff water from these waste piles had been impacting surface and groundwater quality. Reclamation improved water quality and reduced off-site sediment transport.

Upper Laramie Sub-basin (HUC10180010)

This sub-basin includes all the drainages above Wheatland Reservoir #2. Major drainages in the Upper Laramie Sub-basin are the Laramie and Little Laramie Rivers whose headwaters are in the Medicine Bow Mountains. Land uses are logging, recreation, and grazing at higher elevations; grazing, irrigated hay production, and some oil and gas development in the lower elevations.

Table A11-1. Impaired or Threatened Water Bodies Located within the RMPPA

Wyoming Draft 2004 303(d) List of Waters: List of Impaired or Threatened Water Bodies Located within the RMPPA[1]							
Basin	**HUC**	**Name**	**Location**	**Cause of Impairment**	**Source**	**Uses Impaired**	**Date Listed**
Water Bodies with Water Quality Impairments (Excerpts from Table A)							
Little Snake	14050003	Battle Creek, West Fork	From Battle Crk. To Haggarty Crk.	Copper	Point, Natural	Cold Fish, Aquatic Life	2000
Little Snake	14050003	Haggarty Creek	From Ferris-Haggarty Mine to West Fork Battle Crk.	Silver, Copper, Cadmium	Point, Natural	Cold Fish, Aquatic Life	1996
South Platte	10190009	Crow Creek	Impairment undetermined distance above and below Cheyenne.	Ammonia, Fecal Coliform	Non-point Undetermined	Fisheries, Aquatic Life, and Contact Recreation	1996
South Platte	10190009	Middle Crow Creek	Exceedences measured at FS Road 700. Impairment thought to be limited to grazing allotment pasture.	Fecal Coliform	Non-point Undetermined	Contact Recreation	2004
Water Bodies with Water Quality Threats (Excerpts from Table C)							
Little Snake	14050003	Loco Creek, West Fork	All of West Fork Watershed above Loco Creek.	Habitat Deg., Nut., Temp.	Non-point	Cold Fish, Aquatic Life	1996
Little Snake	14050003	Savery Creek	Below Little Sandstone Creek to Little Snake River.	Habitat Degradation	Non-point	Cold Fish, Aquatic Life	1998
Little Snake	14050004	McKinney Creek	Above Muddy Creek to Eagle Creek.	Habitat Degradation	Non-point	Cold Fish, Aquatic Life	1996
Little Snake	14050004	Muddy Creek	West of State Hwy. 789.	Habitat Degradation	Non-point	Cold Fish, Aquatic Life	1996
Little Snake	14050004	Muddy Creek	Above Alamosa Gulch to Littlefield Creek.	Habitat Degradation	Non-point	Cold Fish, Aquatic Life	1996
Little Snake	14050004	Sage Creek	From confluence with North Platte River to State Hwy. 71.	Habitat Degradation	Non-point	Cold Fish, Aquatic Life	1996

[1]*Downloaded from http://deq.state.wy.us/wqd/events.asp in February 2004.*

DEPLETIONS TO RIVER SYSTEMS RESULTING FROM BLM-APPROVED ACTIVITIES

Depletions are the amount of water in a river system that is unavailable to fish, plant, or wildlife species as a result of water development or use. This is typically calculated based on a monthly mass balance calculation and therefore can include water that is stored in headwaters and/or water lost through consumptive use or evaporation. The Colorado River System has regional management plans and a recovery program, which began in 1988, to address depletions (Roehm 2003). The Platte River has interim policy guidance and a method for accounting for depletions. An EIS for the cooperative agreement for a recovery program is in draft form (USBOR and USFWS 2004). Because the Great Divide Basin is a closed basin with internal drainage, there are no impacts to river systems with threatened or endangered species requiring consideration of depletions resulting from BLM management actions.

The RFO participates in management plans and the recovery program for the Colorado River as well as the interim policy in the Platte River Basin. Any BLM-approved project that results in a federal nexus (requiring federal approval because of the use of federal resources including minerals or land use) that may result in depletion to these systems would be addressed during the National Environmental Protection Agency (NEPA) analysis for that particular project. If required the BLM will consult with the U.S. Fish and Wildlife Service (USFWS) on these depletions and potential impacts to protected species.

Colorado River System

A Biological Opinion (BO) was issued in 2000 to cover Colorado River depletions from livestock watering facilities. It was determined that individual projects causing 100 acre-ft or less of average annual depletion would be included in a programmatic approach and projects greater than 100 acre-ft would still be individually consulted on (USFWS 2000). The recovery program was established in 1988 based on the needs of the endangered Colorado pikeminnow (*Ptychocheilus lucius*), endangered humpback chub (*Gila cypha*), endangered bonytail (*Gila elegans*), endangered razorback sucker (*Xyrauchen texanus*), and designated critical habitat for these fish.

A management plan for the Yampa River basin is currently in draft form (Roehm 2003). This plan quantifies current depletions as well as projects depletion through 2045. This is a joint effort between Wyoming and Colorado to account for water development projects that lead to depletions. As projects occur on BLM land or need right-of-way (ROW) actions across BLM land, they will be evaluated to consider adequacy under the plan if it is adopted. Most of the projects mentioned in the Yampa River Management Plan will be initiated by the State of Wyoming and/or local water conservancy districts.

Depletions from other activities such as oil and gas development are handled for individual projects and considered during the NEPA process. Water is used for drilling operations, hydrostatic testing of pipelines, and dust abatement. The source of this water can vary but direct withdrawals from surface waters are generally not allowed for these uses. Common potential sources include municipalities (Baggs, Wyoming) or state-approved wells. If it is determined that these sources are tributaries to the surface waters in question, depletions would be consulted on with the USFWS. Produced water during oil and gas activities is evaluated during the NEPA process to determine potential connections between the producing geologic formation and surface waters. Methods for making this determination can include isotopic analysis, water quality data, and/or groundwater modeling.

Platte River System

The species of concern in the Platte River system are the whooping crane, least tern, piping plover, and pallid sturgeon. A programmatic approach was developed to protect the hydrology required to maintain critical habitat for these species in Nebraska (BLM 1999). This programmatic approach addressed small depletions of less than 25 acre-feet per year. A fund was set up to account for these small depletions. For larger depletions, an individual consultation is required.

Water development in the Platte River Basin is less common because of fully appropriated water rights in most of the basin. Most of the irrigated agriculture that is near RFO BLM administered lands is in this basin, and this system has two large reservoirs (Seminoe and Pathfinder) that regulate flows of the North Platte and store water for municipal and agricultural use. There is at least one transbasin diversion from the Colorado River system to the Platte river system in Wyoming to meet municipal water uses in Cheyenne.

Oil and gas activities and mineral development (specifically coal mining and natural gas extraction from coals) typically dewater geologic formations to extract resources. In the Platte River system, this will add non-tributary water from these formations to the Platte River system. Reasonably foreseeable development includes the discharge of significant amounts of water into the Platte River system. Although some anticipated actions have not been approved, some of this non-tributary water may be available to meet species needs downstream.

All non-tributary water added to the system needs to be accurately measured to be used to meet species needs and would be discharged above Seminoe and Pathfinder reservoirs and therefore managed for this use by reservoirs along the North Platte. All water discharged must be approved by the State of Wyoming under its National Pollutant Discharge Elimination System (NPDES) Program (http://deq.state.wy.us/wqd/pointsources.asp, accessed 2003). This program requires that water quality not be degraded below numerical requirements for beneficial uses specified for the water bodies receiving the discharges or located below the discharges. Seminoe Reservoir and the North Platte River are water quality classification 2AB, which is the highest numerical standard and is protected for game fish and drinking water. Portions of the North Platte River (Miracle Mile and the headwaters) are considered class 1 waters; this means that the water quality cannot be degraded by point source discharges.

Depletions from activities such as oil and gas development are handled for individual projects and considered during the NEPA process. Water is used for drilling operations, hydrostatic testing of pipelines, and dust abatement. The source of this water can vary but direct withdrawals from surface waters are not allowed for these uses. Water produced during oil and gas activities is evaluated during the NEPA process to determine potential connections between the producing formation and surface waters. Methods for making this determination can include isotopic analysis, water quality data, and/or groundwater modeling.

For projects involving large amounts of groundwater, groundwater modeling considering geology and any data available from local wells will be used to evaluate impacts, including surface waters. Isotopic analysis can be used to determine when water was deposited in groundwater formations and whether the waters are tributary to surface waters. Water quality data along with water pressure can be used to evaluate the homogeneity of groundwaters in formations and to confirm or deny assumptions made by the other methods. A combination of these approaches depending on the scale or likelihood of the potential connection to surface waters will be used to determine if groundwater is tributary. If groundwater use is from tributary systems, it will be considered a depletion and consultation will occur with the USFWS.

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APPENDIX 12—MANAGING WILD HORSE POPULATIONS IN THE RAWLINS RMPPA

The Bureau of Land Management (BLM) monitors the wild horse population to ensure that the population meets the population management objectives set in the land use plan. Monitoring of the habitat and the wild horses has been ongoing within the Herd Management Areas (HMA) for several years and has included some of the following methods and approaches:

- Precipitation data
- Rangeland trends (primarily on uplands)
- Forage utilization data
- Licensed use by livestock grazing allotment
- Wildlife actual use and forage requirements
- Wild horse population data, including, but not limited to the following:
  - Population counts
  - Reproductive rates
  - Age/sex structure
  - Actual use sightings
  - Determining areas of highest horse use, or concentration areas

If an evaluation of monitoring data were to indicate that wild horse management objectives in the land use plan were not being met, population adjustments in land use plans and Herd Management Area Plans (HMAP) could be necessary. Population adjustments would be analyzed prior to initiating maintenance actions in applicable HMAPs and Resource Management Plans (RMP). Monitoring and adjusting the Appropriate Management Level (AML), as necessary, would ensure a thriving natural ecological balance is maintained.

More information on specific management techniques used in managing wild horse populations and the nature of the horses being managed can be found in the *Rawlins Field Office Wild Horse Management Handbook.* This document is an assemblage of all relevant policy and technical guidance that must be considered in developing and implementing wild horse management plans and actions. The handbook is available for review at the BLM Rawlins Field Office, 1300 North 3rd Street, Rawlins, Wyoming.

ESTABLISHMENT AND MODIFICATION OF HORSE MANAGEMENT AREAS AND LEVELS

The current AMLs were established in 1994 from a process that included 5 years of focused, intensive monitoring; evaluation of data; public input; and environmental analysis. Since that time, some boundary adjustments and realignments to the HMAs have been made via the Land Use Plan (LUP) maintenance process.

AML/Population Expression in the Rawlins Field Office

The existing AMLs in the Rawlins Field Office are expressed as the number of adults and yearlings, not including unweaned colts of the year. This definition was included in the 1994 AML evaluation and decision. At the time of the development of these numbers, customary primary inventory times were in the late winter or very early calendar year (typically February or March). The colts of the previous year had perished or survived to approach their first birthday, and the colts of the year had not yet been born.

Thus, the number counted represented what the adult population would be for the following year. Lately, there has been a shift in inventory times to favor the month of July. When a herd is counted at this time, most of the colts of the year have been born and many are 2 months of age or older. Thus, an inventory of the same herd in the same calendar year will yield a higher number, barring some unusual late winter event resulting in unusually high mortality. Inventory practices are under review pursuant to the Consent Decree with the State of Wyoming. Inventory practices may be standardized and any such standardization could well include a uniform method of expressing objective and existing populations. Increased interest in the genetic character of a particular herd has caused some differing views on the expression of population sizes and objectives. Geneticists usually define a population in terms of the effective population (N^E) that consists of the number of competent breeding age animals; therefore, colts of the year, yearlings, a portion of the 2-year olds, and the very old would not be included as part of the effective population count. The AML necessary to maintain an effective breeding population of 100 would be about 165 adult animals, not including unweaned colts. The exact number would vary depending on the age/sex distribution of the particular herd involved.

To change the AMLs and the upper and lower limits associated with the AML to a format that would reflect the above-discussed competent breeding age approach would require adjustments in AML for the Rawlins Management Plan Planning Area (RMPPA) (see HMA Lost Creek (Alternative 3) in Table A12-1). The table also shows the relationship between AML numbers and post-foaling populations of wild horses.

Table A12-1. Relationship Between AML and Wild Horse Populations

HMA	Population Pre-Foaling[1]			Population Post-Foaling[2]		
	AML	Upper Limit	Lower Limit	At AML[2]	At Upper Limit	At Lower Limit
Adobe Town	700	812	588	812	942	682
Stewart Creek	150	177	123	177	209	145
Lost Creek (Alternatives 1, 2, & 4)	70	83	57	83	98	68
Lost Creek (Alternative 3)	165	195	135	195	230	160

Notes:

1 This number includes adult horses and yearlings, not including unweaned colts. This is the definition of appropriate management level included in the 1994 AML evaluation and decision. This definition of AML is conducive to wild horse inventories completed in late winter (February/March), because much of the winter mortality would have already occurred.

2 This number represents the total wild horse population being managed at AML following foaling. Because unweaned colts are not considered in the AML, the total wild horse population may be higher than the AML, although the population is still considered meeting the AML. This number is conducive to wild horse inventories completed in late summer (July/August), because many mares would have foaled, but some of the foals may not survive the upcoming seasons.

Population post-foaling, shown in Table A12-1, represents the total population, including all age classes, and represents the approximate population as of October 1 of a given year. To change the definition of the AML would be an implementation decision and, therefore, appealable.

IMPLICATIONS OF WILD HORSE GENETIC RESEARCH

Wild horses managed on the public lands have a variety of histories and originate from a variety of backgrounds. The genetic roots of most of the horses are predominantly American, and some have beginnings as recent as following World War II. Advances in genetic research have enabled the BLM to identify the specific genetic stock from which a wild horse population originates, thereby assisting in identifying the history of a population. Occasionally populations have been encountered in which their

genetic roots can be traced to the Spanish exploration period through the identification of genotypes associated with the New World Iberian (Spanish Colonial) breeds. Populations with this genetic similarity provide a genetic resource that the majority of wild horses on public lands do not provide. The wild horses in the Rawlins RMPPA Lost Creek HMA are such a population.

In 2001, blood samples from wild horses removed from the Lost Creek HMA were provided to Dr. E. Gus Cothran of the Equine Parentage Testing and Research Laboratory at the University of Kentucky. Results from the genetic analysis of these samples identified a clear contribution from New World Iberian breeds. The highest average genetic association of the blood samples provided was with these "Spanish Colonial" breeds. The next highest average genetic association was with North American Gaited breeds, most likely from the routine escape of domestic saddle stock from the surrounding areas. A full report of the results of this genetic analysis can be obtained from the Rawlins Field Office.

As genetic research continues with the wild horse populations throughout the Red Desert metapopulation, the necessity of maintaining the population of wild horses in the Lost Creek HMA in genetic isolation may vary. If populations adjacent to the Lost Creek HMA share the prevalence of New World Iberian genomes, intermingling these populations would be beneficial to maintain the genetic resource and isolating and maintaining an internally viable population in the Lost Creek HMA would not be required. However, if the New World Iberian genes are prevalent only in Lost Creek, further intermingling could cause this genetic resource to disappear. Continued monitoring and research may result in adjustments to management decisions for the Lost Creek HMA. Adjustments would be implemented following appropriate analysis and maintenance of management documents.

WILD HORSE MANAGEMENT HISTORY IN THE STATE OF WYOMING AND THE RAWLINS RMPPA

In 1971, in response to the passage of the Wild, Free-Roaming Horse and Burro Act, Wyoming BLM identified the existing wild horse habitats and populations in the state that would likely be subject to the provisions of the Act. These identifications were made using the best information and understanding available at the time. The result was 30 areas with populations totaling 4,411 horses. Of those, 1,049 were estimated to be privately owned horses that would be claimed and removed from the range under the provisions of the Act. Those 30 areas comprised a total of 6,557,160 acres of public lands, 389,112 acres of land owned by the State of Wyoming, and 2,479,096 acres of privately owned lands. The 30 areas varied greatly in size and land ownership.

As soon as the Act passed, a number of activities that had served to limit the growth in horse numbers and the expansion of their ranges ceased. Horse populations in Wyoming began to grow.

Almost immediately, BLM personnel began to accumulate additional information about the horses and their habitats. Area boundaries were refined as more was learned about the seasonal needs and habits of horses. By 1974 the list of 30 areas had increased to 40 areas comprised of a total of 6,820,749 acres of public lands, 406,103 acres of land owned by the State of Wyoming, and 2,355,852 acres of privately owned lands. The 40 areas varied greatly in size and land ownership.

The period of 1976 to 1984 saw a great deal of activity in land use planning. For Wyoming, this can be called the Management Framework Plan (MFP) era. During this period, the 40 areas previously identified were combined into 24 areas. The MFP process resulted in identifying 14 of those 24 areas that, in one way or another, failed to meet the suitability for maintaining a long-term healthy population of horses in accordance with the intent of the Act. The two most prevalent criteria were that the area contained significant amounts of private land and that the horse population was too small to continue to thrive when

isolated from customary sources of new genetic stock. The remaining 10 areas were then designated as HMAs. The HMAs comprised 3,322,776 public acres, 152,551 acres of land owned by the State of Wyoming, and 861,022 acres of privately owned land. This process also identified population objectives for these herds, totaling 2,673 horses.

Land use plans and the decisions that they generate are dynamic, adjusting in response to changing environmental conditions or new information. With respect to horses in Wyoming, this has resulted in the 16 HMAs currently recognized in Wyoming. These 16 areas comprise 3,664,002 acres of public land, 154,737 acres of land owned by the State of Wyoming, and 846,243 acres of privately owned lands. The 16 areas still vary in size and land ownership, though not to the extent that they once did. Particularly worthy of note is the significant amount of private land now included within designated HMAs. Much of the private acreage consists of land owned or controlled by the Rock Springs Grazing Association of southwestern Wyoming. It has made its lands available to an agreed-upon number of wild horses since 1979. Without access to those lands, approximately 1.5 million acres of adjoining and commingled public lands would be unavailable for inclusion in HMAs. This would, in effect, eliminate one-third of the free-roaming horses in Wyoming. The current, combined population objective (AML) for wild, free-roaming horses in Wyoming is 3,263. That is 18 percent more than it was in 1980. Without the access to the private lands noted above, the combined AML would be only 2,038.

As noted above, an effective breeding population of 100 horses is necessary to maintain a genetically viable herd of wild horses. Nine of the 16 HMAs in Wyoming do not have AMLs that would indicate genetically stable long-term populations. However, wild horse herds in these HMAs are usually part of a larger metapopulation comprising adjacent HMAs. The metapopulation is the entire gene pool available to a specific herd.

When originally identified and reviewed through planning, HMA boundaries were designated to reflect common herd location, as well as to simplify administration and management of wild horses. As a result, several HMAs may be designated adjacent to one another in different BLM Field Offices, or simply separated by geographic features such as watersheds. The individual populations in each HMA may be separated for most of the year, but both may share the same winter range. Sharing resources allows for regular interaction between the two populations. Interaction allows for horses from each herd to be recruited by and assimilated into the other. Thus, although the AML of the individual HMAs would appear to be genetically deficient, each population is periodically infused with new genetic material and the genetic diversity of both herds is enhanced. In any given year, only a very few bands from each herd may actually exchange members, but over time, the normal behaviors of each herd cause the mixing to become widespread.

From the standpoint of genetic viability, the required level of exchange of animals and the related introduction of new genetic material is not high. In small populations of less than 150 animals, the introduction of one or two competent breeding animals per generation (~10 years) will insure the maintenance of the genetic resource. To be members of a metapopulation, individual animals need not experience frequent, large-scale contact with one another.

Table A12-2 identifies the Rawlins RMPPA wild horse HMAs and the metapopulations in which the HMAs' horses interact.

Table A12-2. Wild Horse Regional Metapopulations Associated With the Rawlins RMPPA

Rawlins RMPPA HMAs		Metapopulation		HMA(s)in the Metapopulation	Type of Interaction	Points of Contact
Name	AML	Name	AML			
Adobe Town	700	Stateline	1,250	Adobe Town Salt Wells Sand Wash (Co)[1]	Male migration, female exchange	Haystacks, Alkali, Sand Creek, Powder Wash
Stewart Creek	150	Red Desert[2]	790	Stewart Cr Lost Creek Antelope Hills Divide Basin	Male migration, female exchange	Hay Reservoir, Bare ring, Hadsell, Osborne Draw
Lost Creek	70	Red Desert[2]	790	Stewart Cr Lost Creek Antelope Hills Divide Basin	Male migration, female exchange	Hay Reservoir, Bare ring, Hadsell, Osborne Draw

Notes:

1 Sand Wash HMA is located entirely in Colorado within the BLM's Craig Field Office. While managed by Colorado BLM, horses from the Sand Wash HMA provide biologically and genetically important interactions with horses from the other HMAs in the metapopulation.

2 Wild horses from the Sweetwater metapopulation (Green Mountain HMA & Crooks Mountain HMA) occasionally mix with wild horses in the Red Desert metapopulation.

In the 30 years since the passage of the Act, the following has occurred in the State of Wyoming:

- The average herd size has increased from 147 to 197.
- The area of public land available for use by horses has increased slightly since 1980.
- The area of private land occupied has decreased from 2.5 million to 846,243.
- The area of private land available for legal use has increased from 0 to 846,243.
- Of the 16 herds, 14 are parts of metapopulations greater than 300.

The same trends that are described for the State of Wyoming also occurred in the RMPPA. In 1971, an estimated 435 horses subject to management under the Act occupied 2,116,095 acres in six areas. Today, an estimated 1,540 horses subject to management under the Act occupy approximately 929,000 acres in three areas.

It should be noted that the BLM has routinely removed excess and stray horses from the range since 1978. During that period, more than 17,000 horses have been removed from Wyoming rangelands and placed through the BLM's Adopt-a-Horse program. And yet the population is still in excess of 6,000 animals, an important indicator that the cornerstone principle of the Act, a thriving ecological balance, is not imperiled by BLM's management of the horses.

POPULATION MANAGEMENT ACTIONS IN THE RMPPA

It should be noted that population management actions in the RMPPA take place as part of a state and national undertaking, which allocates scarce resources and equally scarce space for horses to be removed from the public rangelands so that effective planning and scheduling can take place, bureauwide. No single office controls the fiscal and logistical resources necessary to effect the desired management of horses in its jurisdiction. Instead, each office is part of the BLM-wide wild horse management program. A key part of this program is the identification of a gather cycle for a state. Once established, the gather cycle needs to be adhered to even when this results in gathers taking place in less than ideal conditions within a particular HMA.

AMLs are established to allow for a range of fluctuation in the population and still meet the criteria for a valid AML. In evaluating the AML, a lower limit is identified and then examined to ensure that the particular herd will remain genetically viable if periodically reduced to that level. This is a crucial consideration in many of the smaller herds in the state. Concurrently, the upper limit is evaluated to determine that, under normal climatic conditions, resource damage or other significant conflicts would not be likely to occur if the population were allowed to increase to this level cyclically. The AML will equate to the average population level during a management cycle. AMLs in the Rawlins Field Office do not include the unweaned colts of the year.

Analysis of various gather cycles (occurring outside the scope of this RMP) is occurring as part of the statewide wild horse management strategy. Three- and four-year gather cycles for the state are being evaluated and compared. Cycles longer than 4 years are also being evaluated as part of a management scheme that would employ fertility control to limit population increases.

The fluctuations suggested in Alternative three were determined based on the historically observed rates of increase for the individual herds. As of August 2004, the determination of the gather cycle to be employed in Wyoming is still tentative and awaits further evaluation. When a gather cycle is chosen for implementation in the state, part of the evaluation leading to the choice will be the ability of Wyoming BLM to remain in substantial conformance with the consent decree of August 28, 2003, and all other relevant law and policy. The upper and lower limits would be reevaluated and adjusted to ensure that a thriving ecological balance would be maintained. Because the AMLs were evaluated considering the potential for adverse effects from a 4-year gather cycle and the associated level of population fluctuation, a shorter cycle and lower average population levels would still serve the purposes of the AML determination process.

APPENDIX 13—BEST MANAGEMENT PRACTICES FOR REDUCING NONPOINT SOURCE POLLUTION

This appendix describes best management practices (BMP) utilized to mitigate adverse effects caused by surface-disturbing activities that can contribute to nonpoint pollution. It should be noted that there are multiple volumes of references for BMPs developed by government and nongovernmental agencies to reduce nonpoint sources of pollution. Many of these documents contain specific practices and design criteria. The State of Wyoming Department of Environmental Quality (DEQ) publishes general BMPs for Wyoming, (http://deq.state.wy.us/wqd/watershed.asp#non). Nationwide BMPs for protecting nonpoint source pollution can be found at http://www.epa.gov/owow/nps.

BMPs have been developed through experience working with disturbances in the Rawlins Resource Management Plan Planning Area (RMPPA) from Bureau of Land Management (BLM)-approved actions and should be used in most cases along with Wyoming BLM *Mitigation Guidelines*. These practices are not stipulations but represent practices that in most cases will serve to improve the design and reduce the environmental impact of proposed BLM management actions in the RMPPA. Operators are encouraged to review these practices, incorporate them where appropriate, and where possible develop better methods for achieving the same goals.

The purpose of this section is not to attempt to select certain practices or designs and require that only those be used. It is not possible to evaluate all the known practices and make determinations as to which are "best," nor is it advisable. What is best must be determined as the result of a site-specific investigation of the problem to be solved. What the RFO hopes to accomplish with this appendix section is the prescription of basic construction techniques that could be used regardless of project design or purpose.

Section 303(e) of the *Clean Water Act* and 40 CFR 130.5 require states to maintain a Water Quality Management Continuing Planning Process. The process must establish procedures for adoption and appeals that, among other items, address BMPs. BMPs are advisory rather than regulatory. They are a key element in a state Nonpoint Source Management Plan, with which the Federal Government must comply under *Executive Order 12088* and *Executive Order 12372*, and *Clean Water Act* Sections 319(k) and 301(k). The practices described in this document are designed to meet the intent of the State of Wyoming's BMPs for BLM-approved activities. The reader is encouraged to review the State of Wyoming's lists of BMPs, which have been developed in response to the *Clean Water Act* and address silviculture, grazing, hydrology, as well as policy statement in lieu of BMPs for minerals, and oil and gas (http://deq.state.wy.us/wqd/watershed.asp#non).

MANAGEMENT PLANNING PROCESS

Standard practices or BMPs may develop through the *National Environmental Policy Act* (NEPA) process into stipulations prior to lease or grant issuance, or they may serve as a basis for Conditions of Approval (COA). If these practices (including newly developed techniques) are already incorporated into plans for development submitted by a permittee, such plans may be approved. BLM considers all project proposals, however it is the burden of the applicant to describe the design and construction techniques planned. If a project's design, scheduling, and construction techniques can mitigate environmental concerns, construction may be allowed without COAs.

As directed by the *Federal Land Policy and Management Act* (FLPMA) and bureau policy, BLM has developed a three-tiered resource management planning process to make land use planning decisions. These tiers are policy, Resource Management plans, and Activity plans.

Areas of accelerated soil erosion, poor or unstable soils, eroding stream channels, and threatened or impaired stream reaches for water quality (Water Quality within the RMPPA and River System Depletions Appendix) can be identified as issues during the Resource Management Plan tier of the process or through stakeholder groups with local organizations on listed water bodies. Soil and water conservation practices are addressed in a general fashion during the land use planning tier and in site-specific detail during the activity planning and implementation tier of the process.

BLM's nonpoint source strategy is to continue to—

- Provide cooperation and assistance to state agencies and conservation districts in the management of the public lands to reduce nonpoint source pollution sources.
- Incorporate water quality impacts, including nonpoint sources, into land management actions planned and implemented by BLM, and identify and address nonpoint source water quality issues in BLM Activity plans for specific projects.
- Provide personnel and resources to identify nonpoint source pollution and control techniques through coordinated research efforts and implementation of BMPs.
- Proactively implement program practices in conducting land use and land management activities to reduce or avoid water quality impacts and to improve water quality as necessary to meet management objectives and regulatory requirements.

To protect water quality from nonpoint source pollution, as applied by the RFO on BLM lands, the BMP program consists of—

- Defining practices based on the best information available, which are expected to protect water quality.
- Monitoring to ensure that the practices are applied.
- Monitoring to determine the effectiveness of practices.
- Mitigation to address unforeseen problems after the activity begins.
- Adjustment of design specifications of BMPs for future activities, where appropriate (Monitoring and Evaluation Appendix).

Typically a site- and/or project-specific NEPA analysis will define practices and specify monitoring needs if applicable. The project proponent would then be responsible to mitigate unforeseen problems as they arise, typically with BLM review, and BLM would be responsible to make adjustments to the process or methods used, as needed after each project.

Wyoming BLM policy on reclamation assumes that an area can and shall be ultimately reclaimed, and requires that every surface disturbance on public lands receive attention for short-term stabilization and long-term reclamation. Mitigation measures or BMPs reduce to the extent possible the amount of reclamation that ultimately must take place. The permit or authorization is the means provided for ensuring that mitigation measures or COAs are implemented. Compliance inspections during operations ensure that mitigation, COAs, and/or stipulations are being followed.

Watershed Protection

The entire land surface should be considered for nonpoint pollution control, with specific attention given to areas where the flow of water is concentrated naturally or because of construction (including roads, drainage ditches, and steam channels). Stream sediment, phosphate, and salinity load would be reduced where possible.

The following standard practices are to protect watershed function:

- Construction of ephemeral, intermittent, and perennial stream crossings associated with road and utility line construction generally would be restricted until after spring runoff and until normal flows are established.
- Vegetative buffer strips should be maintained between developed recreational facilities and live water. Prior to installing toilet facilities associated with recreation, ground water protection should be provided for.
- Installation of instream structures for fisheries, watershed, or irrigation enhancement should be completely engineered if the high flow for the stream exceeds 10 cubic feet/second (CFS).
- To minimize long-term surface disturbances within the vegetated sand dunes or other sensitive soils, options such as directional drilling, smaller well pads, and surface lines should be considered. To enhance reclamation success through surface stability, techniques to reduce wind erosion should be considered. These methods could include snow fences, soil tackifiers, and erosion control matting.

Floodplain protection is required by *Executive Order 11988* in reference to federal real property and facilities. The *Executive Order* states that facilities are to be located in a floodplain (i.e., when there is no practicable alterative), that agencies shall ensure that flood protection measures are applied to new construction, or the agency can rehabilitate existing structures; that agencies shall elevate structures rather than fill the land; that agencies provide flood height potential markings on facilities to be used by the public; and, when the property is proposed for lease, easement, right-of-way, or disposal, the agency must attach restriction on uses in the conveyance or withhold from such conveyance.

For the most part, standard practices to protect water quality and floodplains are to avoid surface-disturbing activity in identified 100-year floodplains, within 500 feet of perennial waters and wetland/riparian areas and 100 feet from the inner gorge of ephemeral channels. These buffers provide an opportunity for concentrated flows to be dispersed before they reach a water body and often preclude construction in riparian zones, except for linear features. Surface-disturbing activities and permanent facilities placement avoid these buffers unless it is determined through site-specific analysis that there is no practical alternative. If such a circumstance exists, then all practical measures to mitigate possible harm to the above areas are employed. These mitigating measures would be determined case by case and may include (but are not limited to) diking, lining, screening, mulching, terracing, and diversions.

Identified floodplains by their very nature are unsafe locations for permanent structures. With an inundation of flood waters, soils disturbed by construction could experience a rate of erosion greater than undisturbed sites. There is an additional concern over the potential for flood waters to aid in the dispersal of hazardous materials that may be stored within permanent structures. Identified floodplains should have no permanent structures constructed within their boundaries unless it can be demonstrated on a case-by-case basis that there is no physically practical alternative. In cases where identified 100-year floodplain construction is approved, additional constraints would be applied through COAs.

Soils

Current objectives focus on soil conservation planning for surface-disturbance actions. Soil conservation should be addressed during the initial phase of any surface-disturbing action, thereby maintaining soil productivity and stability levels through the use of existing guidelines and techniques. Some areas may require more thorough soil management practices than others, however this is dependent on the type and duration of the action and the effect on site-specific soil characteristics.

Management of the soil resource would continue to be based on the following factors: (1) evaluation and interpretation of soils in relation to project design and development, (2) identification and inventory of soils for baseline data (soil surveys), and (3) identification and implementation of methods to reduce accelerated erosion of top soil. These factors are discussed below.

Evaluation and interpretation of soils involve identification of soil properties that would influence their use, and recommendations for development while minimizing soil loss. Projects would be examined on a site-specific basis, evaluating the potential for soil loss and the compatibility of soil properties with project design. Stipulations and mitigating measures are provided on a case-by-case basis to ensure soil conservation and practical management. Projects requiring soil interpretations include construction of linear right-of-way facilities (i.e., pipelines, roads, railroads, and power transmission lines); construction of water impoundments; rangeland manipulation through fire or mechanical treatments; construction of plant site facilities, pump stations, well pads, and associated disturbances; and reclamation projects.

Soil surveys are designed to update general soils information and to provide data to those areas lacking soil inventories. Allotments and areas impacted by oil and gas projects will receive priority in the soil survey process, and BLM will encourage and participate in soil surveys as opportunities arise.

Before a surface-disturbing activity is authorized, topsoil depth would be determined. The amount of topsoil to be removed, along with topsoil placement areas, would be specified in the authorization. The uniform distribution of topsoil over the area to be reclaimed would be required unless conditions warrant a varying depth. On large surface-disturbing projects (e.g., gas processing plants), topsoil would be stockpiled and seeded to reduce erosion. Where feasible, topsoil stockpiles would be designed to maximize surface area to reduce impacts to soil microorganisms. Stockpiles remaining less than 2 years are best for soil microorganism survival and native seed viability. It is recommended that stockpiles be no more than 3 to 4 feet high. Areas used for spoil storage would be stripped of topsoil before spoil placement. The replacement of topsoil after spoil removal would be required.

Some examples of standards applied throughout the RMPPA area based on soil management criteria are as follows:

- Individual road closures due to saturated soil conditions when soil resource damage would occur due to wheel rutting or compaction of wet soils
- Salvage and subsequent replacement of topsoil whenever possible on surface-disturbing activities
- Avoiding disturbance on unstable slopes or slopes greater than 25 percent
- Identification of critical erosion condition areas during site-specific project analysis, and Activity plan development for the purpose of avoidance and special management
- Temporary disturbances which do not require major excavation (e.g., small pipelines and communication lines) may be stripped of vegetation to ground level using mechanical treatment, leaving topsoil intact and root mass relatively undisturbed.

Compaction or permeability testing should be used to determine pit characteristics in conjunction with BLM engineers. If clay soils are used as stock pond lining, they should have a liquid limit greater than 30 and a Plasticity Index of at least 20. Assuming that bentonite would sufficiently seal a pit is not a good procedure, because the bentonite must be adequately compacted, with uniform coverage and density. If not, a chemical reaction may occur between the bentonite and native soil particles. Bentonite is also subject to cracking if it is not designed properly, and the layer may be penetrated by hooves if not buried sufficiently.

In general, emphasis should continue to be placed on the reduction of soil erosion and sediment. Of particular importance would be those areas with saline soils or with highly erodible geology and soils.

Airborne Dust and Air Quality

BLM actions must comply with all applicable air quality laws, regulations, and standards. As projects are proposed that include possible major sources of air pollutant emissions, air quality protection-related stipulations are added to BLM permits and rights-of-way grants. In addition, BLM coordinates with DEQ, Air Quality Division (DEQ-AQD), during the process of analysis. This coordination results in technical review of applications for permits and/or identification of additional stipulations to be applied to these permits.

Dust Control:

The following standard practices limit the emission of fugitive dust:

- The use of water or chemicals to control dust in the demolition of structures, construction operations, grading of roads, or clearing of land.
- The use of water for dust abatement may be considered on a case-by-case basis. The water should meet state standards for this use and be permitted by the Wyoming State Engineers Office. Only the water needed for abating dust should be applied; this method should not be used as a water disposal option under any circumstances. There should be no traces of oil or solvents in water used for dust abatement.
- All-weather surfacing of roads using gravel or asphalt paving and the application of water or suitable chemicals to keep dust in place on roads or materials stockpiles.
- Appropriate road design including shape, drainage, and surface material to protect the roadbed from being eroded.

Prescribed Fire Emissions:

Emissions that may be created directly by BLM activities are mitigated for. Prescribed fires are conducted to reduce emissions by burning only at appropriate fuel moistures and wind speeds (among other factors), which reduces as much as possible the smoke created in locations near populated areas. All BLM activities that may potentially cause undesirable air quality impacts are also coordinated with Wyoming DEQ-AQD. Permits to conduct these activities are secured (where necessary) before the activity begins to ensure compliance with all Federal, state, and local air quality laws.

Pipelines and Communication Lines

Existing roads would be used for access to utility lines where possible to minimize surface disturbances. Where possible, clearing of pipeline and communication line rights-of-way would be accomplished with the least degree of disturbance to topsoil. Where topsoil removal is necessary, it would be stockpiled (wind-rowed) and respread over the disturbance after construction and backfilling are completed. Vegetation removed from the right-of-way would also be required to be respread to provide protection, nutrient recycling, and a seed source.

On ditches exceeding 36 inches in width, 6 to 12 inches of surface soil should be salvaged where possible from disturbed sites. When pipelines and communication lines are buried, there should be at least 48 inches of backfill on top of the pipe. Backfill should not extend above the original ground level after the fill has settled. Bladed surface materials would be respread on the cleared route once construction is completed.

To promote soil stability, the compaction of backfill over the trench would be required (not to extend above the original ground level after the fill has settled). Water bars, mulching, and terracing would be required as needed to minimize erosion. Instream protection structures (e.g., drop structures) may be required in drainages crossed by a pipeline to prevent erosion.

For communication lines or other small lines, like plastic water lines that do not require trenching, a ditch witch or similar trenching machine should be used to reduce disturbance and the need for reclamation.

Grazing BMPs

Proper grazing is the practice of managing forage harvest by all grazing animals including domestic livestock at a sustainable yield that does not accelerate erosion and sedimentation above acceptable levels for the receiving waters. Proper grazing will maintain or increase plant cover including residue, which should in turn slow down or reduce runoff and increase water infiltration. Allotment Management plans, Conservation plans, or similar documents should contain a list of the BMPs most appropriate for the area. Management plans must be developed with reasonable goals and objectives, and progress toward goals and objectives must be monitored. Monitoring must include measures of actual changes in resource conditions as well as measurements of completion of objectives and tasks. BMPs have been developed for domestic animals, wildlife (big game, small game, and nongame), wild horses, grazing in wetland/riparian areas, fencing, livestock herding, access roads, water development both instream and offstream, biological and mechanical land treatment, weed and pest management, and windbreaks (Wyoming DEQ, 1997).

BLM *Healthy Rangelands Standards and Guidelines* (Monitoring Methods to Assess Wyoming Standards and Guidelines for Healthy Rangelands Appendix) will be used for assessment of water quality issues associated with BLM activities. Allotments are evaluated based on these criteria, and BMPs can be developed within Allotment Plans to improve or maintain these standards. Included in these assessments are an evaluation of water quality, wetland/riparian areas, and upland conditions, among other factors. These serve as the guidance and goals for Allotment Plans and would be used to evaluate monitoring (Monitoring and Evaluation Appendix). These BMPs are developed at the site-specific level of planning to account for local constraints and conditions.

Many grazing systems exist, and there is no single system for all vegetation types. The proper system or combination of systems must be selected to fit any given site. Consideration must be given to season of use, soil type, precipitation, range condition, stocking rates, type of livestock, plant growth rates, and ecological site potential. The numbers of all grazing animals should be maintained in balance with their

habitat. Options for developing a grazing management system at a particular location include but are not limited to the following factors:

- Livestock stocking rates
- Wild horse and/or wildlife densities
- Livestock, wild horse, or wildlife distribution
- Timing and duration of each rest (including complete rest) and grazing period
- Livestock kind and class
- Forage allocation for livestock, wildlife, and wild horses
- Water developments to improve distribution
- Salt/mineral supplements (these should be located away from water sources)
- Livestock access control
- Rehabilitation measures.

Well Pads and Facilities

Site-specific reclamation procedures would be developed in each Application for Permit to Drill (APD), right-of-way (ROW) application, or Sundry Notice submitted to BLM for review and approval prior to the authorization of surface-disturbing activities, upon which mitigation measures can be applied.

Both produced water and reserve pits should be constructed to ensure protection of surface water and ground water. The review to determine the need for installing lining material should be performed on a case-by-case basis and should consider soil permeability, water quality, and depth to ground water. Oil-based muds would be allowed in closed drilling systems. Drill cuttings and any remaining oil-based drilling fluids would be disposed of in an environmentally acceptable manner. Pits will be lined if there is not sufficient clay in the subsurface to protect building material, for preventing infiltration of fluids into shallow ground water.

Reserve pits would not be located in areas where ground water is less than 50 feet from the surface and soil permeability is greater than 10^{-7}cm/hr. If ground water is encountered during setting of the conductor, a closed drilling system will be used. Pits would be fenced as specified in individual authorizations. Any pits with harmful fluids in them shall be maintained in a manner that would prevent migratory bird mortality. Drilling pits are exempt from hazardous waste regulations as long as they are covered with 5 feet of soil after use.

Abandoned sites must be satisfactorily rehabilitated in accordance with a plan approved by BLM (see Restoration section). Soil samples may be analyzed to determine reclamation potential, appropriate reseeding species, and nutrient deficits. Tests may include pH, mechanical analysis, electrical conductivity, and sodium content. Terraces or elongated water breaks would be constructed after slope reduction. Disturbances should be reclaimed or managed for zero runoff from the location until the area is stabilized. All excavations and pits should be closed by backfilling and contouring to conform to surrounding terrain. On well pads and larger locations, the surface use plan would include objectives for successful reclamation, including soil stabilization, plant community composition, and desired vegetation density and diversity.

On producing locations, operators would be required to reduce slopes to original contours (not to exceed 3:1 slopes). Areas not used for production purposes should be backfilled and blended into the surrounding terrain and reseeded. Erosion control measures should be installed, as they would be required after slope reduction. Facilities would be required to approach zero runoff from the location to avoid contamination and water quality degradation downstream. Mulching, erosion control measures, and fertilization may be required to achieve acceptable stabilization.

Any produced water pit that shows indications of containing hazardous wastes would be tested for the Toxicity Characteristic Leaching Procedure constituents. If analysis proves positive, the fluids would be disposed of in an approved manner. The cost of the testing and disposal would be borne by the potentially responsible party.

No surface disturbance is recommended on slopes in excess of 25 percent unless erosion controls can be ensured and adequate revegetation is expected. Engineering proposals and revegetation and restoration plans would be required in these areas.

Reclamation

Current BLM policy recognizes that there may be more than one correct way to achieve successful reclamation, and a variety of methods may be appropriate to the varying circumstances. BLM should continue to allow applicants to use their own expertise in recommending and implementing construction and reclamation projects. These allowances still hold the applicant responsible for final reclamation standards of performance. All reclamation needs to conform to BLM reclamation policy (BLM, 1990a)

BLM reclamation goals emphasize (1) protection of existing native vegetation, (2) minimal disturbance of existing environment, (3) soil stabilization through establishment of ground cover, (4) establishment of native vegetation consistent with land use planning, and (5) monitoring and management of the reclamation sites to evaluate reclamation success.

All reclamation is expected to be accomplished as soon as possible after the disturbance occurs, with efforts continuing until a satisfactory revegetation cover is established and the site is stabilized (3 to 5 years). Only areas needed for construction would be allowed to be disturbed.

On all areas to be reclaimed, seed mixtures would be required to be weed-free and site-specific, composed of native species, and would be required to include species-promoting soil stability. A predisturbance species composition list must be developed for each site if the project encompasses an area where there are several different plant communities present. Livestock palatability and wildlife habitat needs would be given consideration in seed mix formulation. BLM guidance for native seed use is BLM Manual 1745 (Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants), and *Executive Order 13112* (Invasive Species).

Interseeding, secondary seeding, or staggered seeding may be required to accomplish revegetation objectives. During rehabilitation of areas in important wildlife habitat, provision would be made for the establishment of native browse and forb species if determined to be beneficial to the habitat affected. Follow-up seeding or corrective erosion control measures may be required on areas of surface disturbance which experience reclamation failure.

Trees, shrubs, and ground cover (not to be cleared from ROWs) would require protection from construction damage. Backfilling to preconstruction condition (in a similar sequence and density) would be required. Restoration of normal surface drainage would also be required.

Any mulch used would be free from mold, fungi, or noxious or invasive weed seeds. Mulch may include native hay, small-grain straw, wood fiber, live mulch, cotton, jute, synthetic netting, and rock. Straw mulch should contain fibers long enough to facilitate crimping and provide the greatest cover.

The grantee or lessee would be responsible for the control of all noxious and invasive weed infestations on surface disturbances. Aerial application of chemicals would be prohibited within 1/4-mile of Special Status plant locations. Control measures would adhere to those allowed in the RMPPA Noxious Weed

Control and Commercial Site Vegetation Control Environmental Assessment (EA) (WY-037-EA6-122), and Vegetation Treatment on BLM Lands in Thirteen Western States Environmental Impact Statement (EIS) and Record of Decision (ROD) (1991). Herbicide application would be monitored by the BLM Authorized Officer.

Types of Roads

Access Roads:

Access roads should be kept to a minimum and used when dry or when all-weather surfaced. Adequate drainage and erosion minimization should be incorporated into road design. Roads should be designed to encourage the shedding of water from the surface before it gains enough concentration or velocity to cause erosion. After water is shed from the road surface, energy dissipation structures should be designed, again with the goal to reduce the concentration and velocity of water. There are two types of roads throughout the RMPPA: this discussion will address both two-track undeveloped access roads, and designed and maintained surfaced roads.

Undeveloped Two-Track Roads:

Use of undeveloped two-tracks should be kept to a minimum, and they should only be used during dry conditions, if possible. If areas are identified with multiple two-tracks with the same destination, brush barriers or signing should be used to identify the best quality two-track road to discourage use of other unnecessary two tracks. As funding is available, these unnecessary two-tracks should be reclaimed.

If erosional features are present on necessary two-tracks, including but not limited to excessive rutting with evidence of concentrated flow during storm events, sediment deposition adjacent to the two-tracks, ponding in ruts, and/or ruts greater than 6 inches in depth, the road should be considered for a designed surface road. If the road is not improved, drainage should be improved by the installation of water bars, culverts, and/or wing ditches to reduce concentrated flows.

Developed or Designed Roads:

Roads would be constructed as described in BLM Manual 9113. New main artery roads would be designed to reduce sediment loading to surface waters. Where necessary, running surfaces of the roads would be graveled if the base does not already contain sufficient aggregate. Developed roads would be upgraded to an all-weather surface if access will occur during winter months or if the road is in sensitive soils.

All developed roads should be designed and maintained to preserve some type of surface shape to reduce water concentration, surface flow, ponding, and resulting safety and maintenance problems. Two commonly accepted surface shape designs are crowned roads, where the center of the road is at the highest elevation and the sides are lower, allowing for the shedding of water off the road surface; and outsloped roads that shed water to the downslope side of the road. Insloping should only be used when outsloping or crowning is infeasible because of safety considerations, or erosion on the outslope is a great concern, as drainage on the inslope will require ditches and cross-drainage. Outsloped or insloped roads should only be used on roads with less than 6 percent grade (BLM, 1982).

On surfaced road with grades greater than 8 percent, surface shape alone will probably not be enough to protect the road surface, and cross-drainage systems should be considered (USDA, 1997). The two most common approaches are waterbars that shed water from the surface of the road, and drainage ditches or

culverts to transport water from the road surface to a location where concentrated flow is dispersed. BLM manual section 9113 should be used for accepted specifications.

To control or reduce sediment from roads, guidance involving proper road placement and buffer strips to stream channels; surfacing; proper drainage; and in some cases redesign or closure of old roads, or seasonal closures, would be developed when necessary. Construction may also be prohibited during periods when soil material is saturated, frozen, or when watershed damage is likely to occur.

On newly constructed permanent roads, the placement of topsoil, seeding, and stabilization would be required on all cut and fill slopes unless conditions (e.g., rock) prohibit it. No unnecessary sidecasting of material (e.g., maintenance) on steep slopes would be allowed. Snow removal plans may be required so that snow removal does not adversely affect reclamation efforts or resources adjacent to the road.

Reclamation of abandoned roads would include requirements for reshaping, recontouring, resurfacing with topsoil, installing water bars, and seeding on the contour. Removal of structures such as bridges, culverts, cattleguards, and signs usually would be required. Stripped vegetation would be spread over the disturbance for nutrient recycling where practical. Fertilization or fencing of these disturbances would not normally be required. Additional erosion control measures (e.g., fiber matting) and road barriers to discourage travel may be required in addition to signing.

Road closures may be implemented during crucial periods (e.g., wildlife winter periods, spring runoff, and calving and fawning seasons). These would require signing or the areas being designated in a publicly available map.

Methods for Shedding Water From Road Surfaces:

Shedding water from road surfaces can be performed by installing water bars on steep sections and not allowing ruts to develop in others. Wear on access roads can be significantly reduced by minimizing use when the roads are wet. Good design on access roads with a significant amount of traffic can include surfacing; installation of road drainage, such as wing ditches and culverts; and proper maintenance. As necessary for erosion control and energy dissipation, structures such as wing ditches, riprap, and culverts should be part of the road design. Riprap should be placed around outlets of culverts and the inlets of drainage structures where possible. All riprap should be angular rock and should be placed on geotextile fabric. Culverts should be considered for cross-drainage when travel is expected to exceed 10 to 15 vehicles per day, regardless of surface design, and culverts should be 18 inches or greater in diameter (BLM Manual 9113).

Methods for Designing Road Crossings:

Active streams are those that maintain aquatic vegetation, animal or fish populations. Other stream crossings should follow BLM Manual 9113 specifications. The majority of active streams are intermittent or perennial, however there may be some portions of ephemeral systems that meet this definition. All crossings should consider the failure of the crossing during flows beyond the design capacity. This can be accomplished by allowing the road fill to be breached in predetermined locations during storm events greater than the design capacity, and by not diverting the water to a new pathway causing gullying, erosion, and formation of a new channel.

The goal of any design should be to maintain current fluvial processes for moving sediment and flow in the active channel. This results in designs that do not confine flows to only one portion of the channel or flood plain and do not result in a grade change through the crossing. Channel dimensions are a good indicator of the range of water, debris, and sediment yields in the channel. The active stream bed width or

annual scour can be used as an estimate of the area required for the crossing to pass typical (1.5- to 2-year reoccurrence) flows. Similarly, the eroded area with temporary vegetation and flood terracing can be used as indicators of extreme events for reoccurrence intervals greater than 2 years. These field measurements, along with peak flow events (Miller, 2003) and other empirical methods, should be used to determine design criteria for crossings.

In general crossings designed to pass 100-year storm events would in most cases allow for unrestricted passage of flow and sediment from smaller storms. Crossing designs that simulate natural stream processes and provide unrestricted passage of flow and sediment can include bridges, low-water crossings, culverts, and bottomless culverts. The appropriate design should be chosen after careful consideration of local conditions, including hydrologic conditions, soil erodibility, road utilization, and aquatic species presence.

Where new or replacement culvert designs are chosen for crossings of active streams, the Active Channel Design Option should be followed if the channel slope is less than 3 percent, the culvert is less than 100 feet in length, or passage is required for aquatic species. Design criteria specific to the Active Channel Design Option include the following:

- **Culvert width:** the minimum culvert width shall be equal to or greater than 1.5 times the active channel width.
- **Culvert slope:** the culvert shall be placed level (0 percent slope).
- **Embedment:** the bottom of the culvert shall be buried into the streambed not less than 20 percent of the culvert height at the outlet and not more than 40 percent of the culvert height at the inlet. Embedment does not apply to bottomless culverts.

At sites where the channel slope is greater 3 percent or culvert length would exceed 100 feet, additional consideration should be given to alternate design options such as bridges or low-water crossings because of the difficulty of providing for the passage of aquatic species through culverts installed at these sites.

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APPENDIX 14—CONSERVATION MEASURES

The following conservation measures for all Threatened and Endangered (T&E) and Special Status Species will be applied.

1. The Rawlins Field Office (RFO) biologists will conduct surveys (following established protocol), or assume species presence, for all likely affected T&E and Special Status Species habitat or potential habitat before authorizing surface disturbing activities. Proposed projects will be designed and locations selected to minimize disturbances to species and habitat, and if avoidance is not possible, informal consultation with the U.S. Fish and Wildlife Service (USFWS) will be initiated. To reduce impacts on these species, projects will not be authorized during critical time periods. Early coordination with the USFWS to benefit the species will be conducted on a case-by-case basis.

2. Areas with high erosion potential or rugged topography (i.e., steep [>25%] slopes, stabilized sand dunes, flood plains, erosive and sandy soils) will be avoided where possible, or specialized mitigation measures will be applied on a case-by-case basis to benefit T&E and Special Status Species.

3. Roads that have the potential to impact T&E and Special Status Species and are not required for routine operation and maintenance of developed and abandoned projects will be reclaimed as directed by the Bureau of Land Management (BLM). As necessary, these roads will be permanently blocked, recontoured, reclaimed, and revegetated to benefit habitat for T&E and Special Status Species.

4. Construction activities within potential or known habitat for T&E and Special Status Species will be minimized through construction site management by use of previously disturbed areas, use of existing rights-of-way (ROW), and designation of limited equipment/materials storage yards and staging areas to benefit habitat for T&E and Special Status Species.

5. To ensure protection of migratory birds and wildlife, reserve, workover, and flare pits and other locations potentially hazardous to wildlife will be adequately protected by netting and/or fencing, as directed by BLM, to prevent wildlife access.

6. To avoid collisions and electrocution of raptors and other avifauna, any power line construction will follow the recommendations of the Avian Power Line Interaction Committee. On a case-by-case basis, power lines will be placed underground or in locations that avoid impacts to T&E and Special Status Species.

7. All production facilities, including compressor and water disposal facilities, will be muffled and maintained so that the noise level at significant habitat sites for T&E and Special Status Species (e.g., bald eagle nests, habitat for species that rely on aural cues for successful breeding) will not exceed 49 decibels.

8. The RFO policy for restricting off-highway vehicles (OHV) to existing/designated roads and vehicle routes or instituting closures, if required, will be implemented to protect plant populations and wildlife habitat.

9. Construction activities within 500 feet of open water and/or 100 feet of intermittent or ephemeral channels in potential or known habitat for T&E and Special Status Species will be avoided.

Stream crossings for roads and pipelines will be constructed during the period of lowest flow (i.e., late summer or fall) and perpendicular to flow. No surface water, or shallow groundwater in connection with surface waters, will be used for proposed projects. Proper erosion control techniques, such as water bars, netting, rip-rap, and mulch, will be implemented.

10. Pesticide applications and biological control agents will be allowed within known T&E habitat on a case-by-case basis. Where possible, biological control of pests will be used rather than chemical control. Pesticides will be used within ¼ mile of habitat only in cases where insect or weed outbreaks have the potential to degrade an area's ecological health. Where it is necessary to use pesticides within ¼ mile of habitat, the pesticides will be applied by hand. Outside the ¼-mile buffer, aerial application of pesticides will be carefully planned to prevent drift. BLM will work with the Animal and Plant Health Inspection Service (APHIS) and USFWS to select a pesticide and a method of application that will most effectively manage the infestation and least affect the species.

11. Riparian habitats will be maintained, improved, or restored to provide wildlife habitat, improve water quality, and enhance forage conditions. In planting or seeding vegetation in areas identified as T&E or Special Status Species habitat, only native species will be selected.

12. In the event that a T&E Species is found, killed, or injured during project activities, or a dead individual is encountered, the USFWS Wyoming Field Office (307-772-2374) and the USFWS Law Enforcement Office (307-261-6365) will be notified within 24 hours of discovery.

13. BLM will participate in development of species-specific recovery plans in coordination with USFWS and other agencies. Populations and habitat on BLM-administered lands will be monitored to determine whether recovery objectives are being met.

14. BLM-administered public lands that contain identified habitat for T&E Species will not be exchanged or sold unless this benefits a species.

15. If prairie dog towns or complexes suitable as black-footed ferret habitat are present at the proposed project level, attempts will be made to locate all project components at least 50 meters (up to 200 meters pursuant to the Federal Land Policy and Management Act of 1976 [FLPMA]) from these towns or complexes to avoid direct impact on towns.

16. All white-tailed prairie dog towns or complexes greater than 200 acres in size, and all black-tailed prairie dog towns or complexes greater than 80 acres, will be avoided. If avoidance is not possible, these areas will be assessed and mapped at the proposed project level. Associated burrow densities of potentially affected towns will be determined, and when habitat is present, a black-footed ferret survey will be conducted, pursuant to USFS and BLM approved techniques.

17. USFWS fact sheets will be posted in common areas and circulated in a memorandum among all BLM employees and service providers. Fact sheets will show the black-footed ferret and its sign and will describe morphology, tracks, scat, skull, habitat characteristics, behavior, current status, and causes of decline.

18. Operators, contractors, and project proponents will be shown how to identify a black-footed ferret and its sign and will be provided with information about its habitat requirements, natural history, status, and threats; the possible impacts of project development activities; and ways to minimize these impacts. Employees will not have pets on work sites within potential or known ferret habitat because canine distemper can be transmitted to black-footed ferrets

19. If any black-footed ferrets or their sign are found, or if surveys find a black-footed ferret or its sign, all previously authorized project-related activities (actions or any future application that might directly, indirectly, or cumulatively affect the colony/complex) ongoing in such towns or complexes will be suspended immediately and Section 7 consultation reinitiated with USFWS.

20. Observations of black-footed ferrets, their sign, or carcasses in the project area, and the location of the suspected observation, however obtained, will be reported within 24 hours to the appropriate BLM wildlife biologist and the field supervisor of the USFWS office in Cheyenne, Wyoming (307-772- 2374). Observations will provide a description, including what was seen, time, the date, the exact location, and the observer's name and telephone number. Carcasses or other suspected ferret remains will be collected by BLM or USFS employees and deposited with the USFS Wyoming Field Office.

21. Surface disturbing and disruptive activities will be intensively managed to maintain or enhance identified potential (within 300 feet of the identified 100-year flood plain) or known habitat for the Preble's meadow jumping mouse. Intensive management may vary from year to year and includes use of inventory, proper distance restrictions, and seasonal or timing restrictions.

22. In habitat suitable for the Preble's meadow jumping mouse, prescribed fire will be designed to burn no more than 25 percent of the Preble's meadow jumping mouse habitat within each linear mile stretch of habitat. The percentage of habitat actually burned in each linear mile will be reported to USFWS. Because of the unpredictability of fire, this measure will be considered to have been achieved if no more than one of every four fires exceeds the 25 percent limit in size. If more than two of the first eight fires in Preble's meadow jumping mouse habitat exceed 25 percent of the suitable habitat, BLM will consult with the USFWS to revise this standard.

23. After burns in suitable habitat within the range of the Preble's meadow jumping mouse, onsite surveys will be conducted to determine whether vegetation has recovered.

24. Surface disturbing and other activities within identified or known breeding habitat (within 300 feet of the identified 100-year flood plain) for the Preble's meadow jumping mouse will not be allowed between May 15 and August 15 for the protection of the mouse.

25. Surface disturbing and other activities within an identified hibernaculum area for the Preble's meadow jumping mouse will be intensively managed between August 16 and May 14 for the protection of the mouse. Intensive management may vary from year to year and includes use of inventory and proper distance restrictions.

26. Surface disturbing activities that may affect bald eagle habitat will be intensively managed in all Raptor Concentration Areas (RCAs) to reduce physical disturbance of bald eagle habitat and disturbance of the birds. This will entail a case-by-case examination of proposals to determine potential effects and appropriate mitigation to minimize adverse effects on bald eagles and their habitat. Intensive management may vary from year to year and includes use of inventory, proper distance restrictions, and seasonal or timing restrictions.

27. RCAs will be open to oil and gas leasing, and a plan of operations (BLM 3809) will be required for disturbances, regardless of the number of acres that will be disturbed, for the protection of bald eagles.

28. BLM-administered lands that are within 1 mile of an integral part of bald eagle habitats, including nests, communal winter roosts, and foraging/concentration areas, will not be exchanged or sold.

29. Surface disturbance or disruptive activities will be prohibited within 1 mile of a bald eagle nest between February 1 and July 15 for the protection of nesting areas.

30. Minimal human activities and habitat alterations, as defined in Appendix II and Appendix Table F-2 of the Programmatic Statewide Bald Eagle Biological Assessment, that might disturb bald eagles will be restricted within suitable habitats that occur within bald eagle buffer zones. Deviations may be permitted after consultation with the USFWS. Buffer zones and applicable restrictions are as follows:

    Zone 1 (within ½ mile of the nest February 1 to August 15) is intended to protect active and alternative nests. For active nests, minimal human activity levels are allowed during the period of first occupancy to 2 weeks after fledging.

    Zone 2 (within ½ to 1 mile of the nest February 1 to August 15) is intended to protect bald eagle primary use areas and permits light human activity levels.

    Zone 3 is designated to protect foraging/concentration areas year-round. This zone would include one of two larger areas, depending on habitat type:

    i. 2.5 miles extending in all directions from the nest

    ii. ½ mile from the streambanks of all streams within 2.5 miles of the nest.

    Site-specific habitat types and foraging areas will be evaluated to determine which Zone 3 buffer applies. Zone delineation depends on habitat types. Exceptions may be made after consultation with USFWS.

31. Surface disturbing or disruptive activities will be prohibited within 2 miles of the communal roost between February 1 and July 15 for the protection of communal roost areas. A communal roost is defined as an area, usually less than 10 acres in size, that contains, or has contained, ≥ 6 bald eagles on any given night. When required, BLM will develop a site management plan (in cooperation with USFWS) to identify potential impacts on active bald eagle nests and/or communal roost sites.

32. Surface disturbing or disruptive activities will be prohibited within 1 mile of bald eagle communal winter roost site between November 1 and April 1 for the protection of wintering bald eagles.

33. No ground disturbing activities will be permitted within ½ mile of active bald eagle communal winter roost sites year-round. This buffer zone restriction may be adjusted on the basis of site-specific information through coordination with, including written concurrence of, the USFWS Wyoming Field Office.

34. Well locations, roads, and ancillary facilities, and other surface structures requiring a repeated human presence, will not be allowed within 1,200 feet of active bald eagle nests. The distance may vary depending on factors such as nest activity, natural topographic barriers, and line-of-sight distance.

35. Appropriately timed surveys in bald eagle habitats will be conducted before any authorization of activities and subsequent performance of activities that might disturb bald eagles or their habitats. A qualified biologist will be approved by BLM to conduct such bald eagle surveys. All nest surveys should be conducted using standard procedures that minimize the potential for adverse

effects on nesting raptors. If species occurrence is verified, the proponent of the activity might be required to modify operational plans, at the discretion of the authorized officer, including instituting appropriate measures for minimization of effects on the bald eagle and its habitat.

36. BLM will monitor and, when and where necessary, restrict authorized or casual use activities that could adversely affect bald eagles or their habitat, including, but not limited to, recreational mining and oil and gas activities. Monitoring results should be considered in the design and implementation of future projects.

37. Each year, BLM will verify the status (active versus inactive) of known bald eagle nests, communal winter roosts, and concentration areas on lands administered by BLM within the Resource Management Plan (RMP) area. To maintain inventory information, BLM will coordinate annually with USFWS, the Wyoming Game and Fish Department (WGFD), and other appropriate entities to determine the status of known and new bald eagle nests, communal winter roosts, and other concentration areas. Known bald eagle nests, communal winter roosts, and concentration areas will be assumed to be active if status has not been verified.

38. To monitor the impacts of site-specific projects authorized under the RMP that are likely to adversely affect bald eagles, BLM will prepare a report describing the progress of each such site-specific project, including implementation of the associated reasonable and prudent measures and impacts on the bald eagle (50 Code of Federal Regulations [CFR] §402.14[i][3]). The report, which will be submitted annually to the USFWS Wyoming Field Office, by January 1, beginning after the first full year of implementation of the Proposed Action, will list and describe (a) adverse effects resulting from the activities of each site-specific project, (b) when and if any level of anticipated incidental take is approached (as allowed by separate Incidental Take Statements from site-specific formal consultation), (c) when and if the level of anticipated take (as allowed by separate Incidental Take Statements from site-specific formal consultations) is exceeded, and (d) results of annual periodic monitoring that evaluates the effectiveness of the reasonable and prudent measures. The report will include such items as (a) assessment of whether implementation of each site-specific project is consistent with that described in the Biological Assessment, (b) compliance with terms and conditions, and (c) documentation of sightings of bald eagles during the activities of each site-specific project.

39. Surface disturbing activities will be avoided within 500 feet of perennial waters and wetland/riparian areas for protection of western yellow-billed cuckoo and identified habitat.

40. Boat and raft landing areas will not be developed, and outfitting camps will not be permitted, in western yellow-billed cuckoo habitat.

41. Surface disturbing or disruptive activities will be prohibited within ½ mile of identified habitat between April 15 and August 15 for the protection of nesting western yellow-billed cuckoos.

42. For the protection of the Wyoming toad and its identified habitat, surface disturbing activities will be avoided in the following areas: (a) identified 100-year flood plains; (b) areas within 500 feet of perennial waters, springs, wells, and wetlands; and (c) areas within 100 feet of the inner gorge of ephemeral channels.

43. For the protection of the western boreal toad and its identified habitat, surface disturbing activities will be avoided in the following areas above 7,500 feet: (a) identified 100-year flood plains; (b) areas within 500 feet of perennial waters, springs, wells, and wetlands; and (c) areas within 100 feet of the inner gorge of ephemeral channels.

44. When developing or improving water sources in the North Platte River system, BLM will consider development designs such as water wells and guzzlers rather than surface impoundments to minimize impacts on surface water hydrology resulting from attenuation of flood peaks and evaporative loss.

45. When developing or improving water sources in the Colorado River system, BLM will consider development designs such as water wells and guzzlers rather than surface impoundments to minimize impacts on surface water hydrology resulting from attenuation of flood peaks and evaporative loss.

46. Known habitat for the blowout penstemon plant will be open to oil and gas leasing with a no surface occupancy (NSO) stipulation.

47. Surface disturbing activities will be intensively managed within identified populations to maintain or enhance habitat for the plant. Intensive management may vary from year to year and includes use of proper distance restrictions, seasonal or timing restrictions, rehabilitation standards, and use of best management practices for livestock grazing, rotational grazing, or fencing, as identified in permit authorizations.

48. Identified habitat for the blowout penstemon plant will be closed to new locatable mineral entry and mineral material sales. Withdrawals will be pursued.

49. Habitat that contains known populations of the blowout penstemon plant will be designated as an Area of Critical Environmental Concern and managed as an endangered plant habitat area.

50. Known habitat for the Colorado butterfly plant will be open to oil and gas leasing with an NSO stipulation. Construction of surface disturbing activities will be prohibited where the NSO is applicable.

51. Grazing will be intensively managed within known habitat containing Colorado butterfly plant populations from July through August to allow plants to bloom and go to seed.

52. Recreational site development will not be authorized in known Colorado butterfly plant habitat.

53. Mineral supplements, hay, or other feeds for livestock will be placed at least ½ mile from known occupied Colorado butterfly plant habitat.

54. Projects that alter the natural hydrology, change the vegetation of riparian ecosystem, or may cause direct ground disturbance will be redesigned to ensure that adverse effects on the plant do not occur.

55. Known habitat for the Ute ladies'-tresses plant will be open to oil and gas leasing with an NSO stipulation. Construction of surface disturbing activities will be prohibited where the NSO is applicable.

56. Grazing will be intensively managed within identified populations from July through September to allow plants to bloom and go to seed.

57. Recreational site development will not be authorized in known Ute ladies'-tresses plant habitat.

58. Mineral supplements, straw, or other feeds for livestock will be placed at least ½ mile from known occupied Ute ladies'-tresses habitat.

59. Projects that alter the natural hydrology, change the vegetation of riparian ecosystem, or cause direct ground disturbance will be redesigned to ensure that adverse effects on the plant do not occur.

APPENDIX 15—FLUID MINERAL BEST MANAGEMENT PRACTICES

Best management practices (BMP) are innovative, dynamic, and economically feasible mitigation measures applied on a site-specific basis to reduce, prevent, or avoid adverse environmental or social impacts. BMPs are applied to management actions to aid in achieving desired outcomes for safe, environmentally sound resource development, by preventing, minimizing, or mitigating adverse impacts, and reducing conflicts.

Reducing Impacts to Big Game Crucial Winter Range

The following BMPs should be applied to reduce impacts to big game crucial winter range:

- Directional drilling
- Drilling of multiple wells from a single pad
- Remote well monitoring
- Piping of produced liquids to centralized tank batteries off site to reduce traffic to individual wells
- Transportation planning (to reduce road density and traffic volumes)
- Cluster development
- Compensation mitigation
- Seasonal restriction of public vehicular access
- Monitoring of wildlife populations during drilling operations and design and employment of additional best management practices whenever monitoring identifies undesirable impacts.

Reducing Impacts to Sage-grouse Habitat

The following BMPs should be applied to reduce impacts to sage-grouse habitat:

- Directional drilling
- Drilling of multiple wells from a single pad
- Seasonal restriction of public vehicular access
- Noise reduction techniques and designs
- Use of low profile well facilities and tanks
- Burying of power lines to avoid use of poles and other tall structures
- Transportation planning to align roads out of sight and sound of leks, and to schedule traffic to avoid sage-grouse activity periods
- Design of roads to minimum safe standard for intended use
- Partial reclamation of high-standard roads needed for project construction to lower standards necessary for maintenance operations
- Monitoring of wildlife populations during drilling operations and design and employ additional best management practices whenever monitoring identifies undesirable impacts
- Avoidance of surface disturbance or occupancy within ¼ mile of the perimeter of occupied sage-grouse leks
- Avoidance of human activity between 6:00 p.m. and 9:00 a.m. from March 1 through May 20 within ¼ mile of the perimeter of occupied sage-grouse leks (These times and dates reflect recommendations from Wyoming Game and Fish Department [WGFD] based on site-specific data for the Resource Management Plan Planning Area [RMPPA].)

- Avoidance of surface disturbance or other disruptive activity from March 1 through July 15, up to 2 miles from an "active" lek in suitable Greater sage-grouse nesting habitat (These dates reflect recommendations from WGFD based on site-specific data for the RMPPA.).

Reducing Impacts to Wildlife Habitat

The following BMPs should be applied to reduce impacts to wildlife habitat:

- Seasonal restriction of public vehicular access
- Noise reduction techniques and designs
- Installation of raptor anti-perch devices
- Monitoring of wildlife populations during drilling operations and design and employment of additional best management practices whenever monitoring identifies undesirable impacts
- Implementation of the Wyoming Bird Conservation Plan from Wyoming Partners in Flight.

Reducing Impacts to Visual Resource Management Class II and III Areas

The following BMPs should be applied to reduce impacts to visual resource management Class II and III areas:

- Burying of distribution power lines and flow lines in or adjacent to access roads
- Repeating of elements of form, line, color, and texture to blend facilities with the surrounding landscape
- Painting of all new facilities a color that best allows the facility to blend with the background, typically a vegetated background
- Final reclamation recontouring of all disturbed areas, including access roads, to the original contour or a contour that blends with the surrounding topography
- Avoidance of facility placement on steep slopes, ridge tops, and hilltops
- Screening of facilities from view
- Following of contours of the land to reduce unnecessary disturbance
- Recontouring and revegetation of disturbed areas to blend with the surrounding landscape
- Reclamation of unneeded roads to the original contour.

Reducing Impacts from Fluid Mineral Construction, Operation, and Reclamation

The following BMPs should be applied to reduce impacts from fluid mineral construction, operation, and reclamation:

- Directional drilling
- Drilling of multiple wells from a single pad
- Transportation planning (to reduce road density and traffic volumes)
- Remote well monitoring
- Piping of produced liquids to centralized tank batteries off site to reduce traffic to individual wells
- Submersible pumps
- Belowground wellheads
- Bussing of workers (to reduce traffic volume)

- Flareless well completions
- Burying of distribution power lines and flow lines in or adjacent to access roads
- Design and construction of all new roads to a safe and appropriate standard, "no higher than necessary" to accommodate their intended use
- Reuse of old roads or pads
- Interim reclamation of well locations and access roads soon after the well is put into production
- Avoidance of facility placement on steep slopes, ridge tops, and hilltops
- Storage of chemicals within secondary containment in case of a spill
- On-site bioremediation of oil field wastes and spills
- Removal of trash, junk, waste, and other materials not in current use.

APPENDIX 16—MOUNTAIN PLOVER STIPULATIONS

To provide further protection and prevent listing of Mountain Plover as an endangered species, the following additional stipulations will apply to occupied habitat (occupied habitat is defined as areas in which broods and/or adults have been found in the current year or documented in at least 2 of the past 5 years):

- No surface occupancy in mountain plover concentration areas.
- Proposed and existing facilities will be moved ½ mile from identified concentration areas.
- Traffic speed and volume on roads traversing concentration areas at night will be reduced from April 10 to July 10.
- During the brood rearing period (i.e., June 1 to July 10), roads within ½ mile of concentration areas will have speed limits of 25 mph on resource roads and 35 mph on other local roads.
- Access roads will be realigned to avoid identified concentration areas.
- Vehicular traffic will be minimized from June 1 to July 10 on roads within ½ mile of concentration areas.
- Work activities will be avoided from ½ hour before sunrise to ½ hour after sunset from June 1 to July 10 in concentration areas.
- Either all power lines will be buried, or poles will include perch-inhibitors within ½ mile of identified concentration areas.
- All fences, storage tanks, and other elevated structures either will be constructed as low as possible and/or will incorporate perch-inhibitors into their design.
- Road-killed animals will be promptly removed from areas within ½ mile of identified concentration areas (federal and state laws would apply).
- Revegetation will consist of seed mixes and application rates designed to produce sparse, low-growing vegetation suitable for plover nesting.
- No reclamation activities or other ground-disturbing activities will be allowed from April 10 to July 10 unless surveys consistent with Plover Guidelines or other United States Fish and Wildlife Service (USFWS) approved methods find that no plovers are nesting in the area.
- Plugged and abandoned wells within ½ mile of the identified concentration areas will be identified by a 4-foot tall marker with a perch inhibitor on top of the marker.

APPENDIX 17—MONITORING AND EVALUATION

INTRODUCTION

Management actions identified for the Rawlins Resource Management Plan Planning Area (RMPPA) are based on studies and the best scientific and commercial information available. However, conditions may change during the life of the land use plan. Experience has shown that implemented management actions can be improved as new technology and new information become available. It is also possible that changes in land use will require a different management action to protect the resources. To address the changing conditions and provide management flexibility that uses best management practices, the Rawlins Field Office (RFO) conducts monitoring and evaluation, which measures the effectiveness of existing actions through monitoring and application of new scientific research. Monitoring and evaluation not only analyzes the current resource conditions as a result of implemented actions but also identifies and recommends alternatives or modified actions, as necessary, to reach established objectives and goals. This process provides the optimum means to check the effectiveness of management actions. Because the capability to conduct the process at the optimum level can vary from year to year, monitoring will be prioritized.

Decisions

Goals and objectives identified in the Record of Decision (ROD) for the land use plan will provide the direction for managing each resource. These goals and objectives are the foundation for developing a monitoring system to track the results of the management actions. Indicators that represent resource conditions or change are identified for monitoring. Performance standards are developed at the activity planning level as guided by the resource goals in the land use plan. Performance standards consider national and state established standards such as the Standards for Healthy Rangelands and others that may have been developed for specific landscapes or resource conditions. Monitoring methods are selected and/or designed to read the indicators as scheduled in the Resource Monitoring Table (see Table A17-1). In addition, data sources for studies and scientific research are identified and selected for use before the process is implemented.

Those actions that are not producing desired results would be modified or replaced based on the assessment of the new data. Where change can be accomplished through an administrative determination or a categorical exclusion, the RFO will make that decision through normal business practices. Changes that require amending the land use plan will follow the amendment process, including the National Environmental Policy Act (NEPA) compliance and public input.

Following the ROD for the Resource Management Plan (RMP), as part of the implementation planning, a monitoring plan would be developed. In addition, monitoring plans would be developed during implementation activities and activity plan development.

Data Collection

Monitoring methods are implemented to collect data that detects any change in the indicators. Monitoring techniques consider when, where, and how often the monitoring will have to be repeated. Because much of the monitoring data is being collected by other federal and state agencies, a system should be established to regularly collect and coordinate this data. Scientific research, the most elusive of all the data, will require each resource specialist's close attention to new technology and the results from research that can be attributed to best management practices for a resource. Developing technologies or

better understanding of information needs may result in changes to the monitoring methods and what is being measured. This issue will be addressed during the assessment step.

The information collected through monitoring provides a variety of information that is applicable to one or more resource uses. Therefore, monitoring methods should be designed to address as many uses as possible. Existing monitoring and data collection from other federal, state, private, or educational institutions would be used where available. This action would increase the effectiveness and efficiency of the monitoring program by eliminating duplication and conflicting information.

Data Analysis

The data collected from all monitoring, studies, and scientific results will be analyzed to determine the change that has occurred as a result of management actions. When a change in resource conditions has been determined, resource specialists and other agency specialists will consult to determine what use or action caused the change. Data analysis will be conducted on a predetermined schedule. This schedule should take into consideration the data collection frequency for detecting change. Data will also be recorded and organized to facilitate analysis that will be used to assess management actions.

Assessment

The analyzed data will be assessed to determine whether the resource conditions are meeting the planned goals and objectives as defined by the performance standards; if a change has occurred, what is the cause; and what appropriate action should be taken to achieve the desired outcome of a management action. New technology and management methods will be reviewed to determine their applicability for use in modifying or replacing current management actions. Occasionally, evaluation of monitoring data may indicate the need for changing the goals and objectives, which would require reinitiating the NEPA/planning process. Where the assessment indicates that the goals and objectives are still valid but the outcome as defined by the performance measures is not being achieved, a change or modification in management actions is warranted. To the degree that those changes have been analyzed in the original NEPA document, no additional NEPA would be required. If those changes have not been previously analyzed, supplemental NEPA will be required.

The assessment will develop recommendations to be considered by management for continuation, modification, or replacement of current management actions. Because adoption of a new management action may require changes in the monitoring plan, the assessment will also evaluate the effectiveness of the monitoring and data collecting methods and will recommend continual use, modification, or elimination.

An assessment team will be established that includes disciplines, expertise, and other agency involvement for conducting a thorough and complete assessment. An assessment schedule should be developed that ensures management actions are evaluated before an irreversible resource condition occurs.

Resource Monitoring Table

The Resource Monitoring Table (see Table A17-1) identifies the indicator that will be monitored to detect change in resource conditions, the method or technique of monitoring, the locations for monitoring, the unit of measurement for monitoring, the frequency and duration for monitoring, and the action triggers or thresholds that indicate the effectiveness of the management action.

The actual indicator, amount, and frequency of monitoring will depend on the consideration of resource sensitivity, number of activities potentially affecting a resource, and manpower and funding. The actual monitoring plans would be developed during implementation activities and activity plan development.

Table A17-1. Resource Monitoring Table

Indicator	Method or Technique	Location	Unit of Measure	Frequency and Duration	Action Trigger
Air Quality					
Air quality	Ambient air sampling and air quality modeling	Area wide	Parts per million	Hourly to 24-hour samples as per standards	Exceeding National Ambient Air Quality Standards. (BLM will inform the appropriate regulatory agencies (Wyoming Department of Environmental Quality-Air Quality Division [WDEQ-AQD] and EPA) if dispersion modeling estimates a potential exceedance of the National Ambient Air Quality Standards [NAAQS] or Wyoming Ambient Air Quality Standards [WAAQS]. The regulatory agencies are responsible for determining whether an actual exceedance has occurred.)
Gaseous and particulate critical air pollutants	Emission inventory	Area wide	Pounds per hour and tons per year.	Annually	Whenever detected
Cultural Resources					
National register eligible sites	Site inspection	Area wide	Disturbance	Annually	Disturbance as a result of land uses or vandalism
Fire					
Fire fuels	Site inspection	Wildland Urban Interface and industrial interface areas	Acres	Annually	Presence of fire fuels that present a risk to communities and industrial sites
Vegetation condition	Ecological site condition and trend studies	Vegetation types where there is a history of fire in the ecosystem	Representative sample	Annually	Vegetation growth trend is moving away from desired conditions for the vegetation type
Resource and property damage	Fire behavior	Individual fire	Fire temperature, flame length, burn rate, and acres burned	While fire is burning	Acres burned and fire intensity exceeds prescription
Forestry					
Forest Health	Ecological site condition and trend	Forested lands	Representative sample area	Every 3 to 5 years	Disease, insect infestation, or encroachment of undesirable plant species threatens forest health
Timber stands	Timber stand exam	Commercial forested areas	Board feet, age class, and damages	Every 10 to 20 years	Basal area growth does not meet timber type standards

Indicator	Method or Technique	Location	Unit of Measure	Frequency and Duration	Action Trigger
Lands and Realty					
Rights-of-Way compliance	Site inspection	Area wide	Site	Annually	Noncompliance or nonuse
Livestock Grazing					
Vegetation condition	Ecological site condition	All areas being grazed	Representative sample of grazed area	Annually	Conditions do not meet the goals and objectives for vegetation community or the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management
Vegetation trend	Ecological site trend	All areas being grazed	Representative sample of grazed area	Every 3 to 5 years	Vegetation type not moving toward objectives and goals
Forage utilization	Utilization study plot or site visit	All areas being grazed	Representative sample of grazed area	During or after area has been grazed	Key plant vigor is deteriorating
Livestock numbers	Counts and site visits	All allotments	Number	Annually or when the livestock is moved on or off the allotment	Exceeds permitted numbers and over use for vegetation condition
Minerals					
Surface disturbance	Remote sensing or site inspection	Mineral development sites	Acres disturbed	Annually	Acres disturbed are exceeding the range established for the area
Compliance with authorization	Area inspection	Area wide	Compliance	During operations or annually	Noncompliance
OHV					
Surface disturbance	Remote sensing or site visit	Site	Acres of disturbance	Annually	Disturbance has exceeded the baseline, accelerated soil erosion is occurring, and vegetation is being removed
Paleontological Resources					
Significant paleontological resources	Site Inspection	Site	Degradation or loss of significant fossil resources	Annually	Loss or damage to significant fossil resources resulting from human or natural causes
Recreation					
General recreation use	Inspection or remote sensing	Area wide, with emphasis on dispersed recreation	Change over time and visitor days	Annually	When change is causing undue or unnecessary degradation of the site or area

Indicator	Method or Technique	Location	Unit of Measure	Frequency and Duration	Action Trigger
Concentrated recreation use	Inspect developed recreation sites or areas that have facilities	Recreation site	Condition of recreation site, facilities, and visitor days	Annually	When change is causing undue or unnecessary degradation of facilities and use areas
Compliance with commercial authorization	Administrative review, site inspection	Activity site	Permit stipulations, resource conditions, and site restoration	During and after an event	When noncompliance is determined or degradation of resources are occurring
Special Management Areas					
Resource condition	Site visit or remote sensing	Special management area	Amount of degradation or loss of resources	Every 1 to 5 years	Undue or unnecessary degradation or loss of resources as a result of human or natural causes
Transportation and Access Management					
Roads and vehicle routes	Road and vehicle route inspection through on site inspection or remote sensing	Area wide	Miles	Annually	When conditions represent a hazard to life and property
Vegetation					
Trend	Appropriate method from National Range Handbook	Area wide	Representative sample	Every 3 to 5 years	Vegetation change from baseline or moving away from ecological status desired
Vegetation change	Photo Points	Area wide	Representative sample of vegetation type	Every 2 to 10 years	Used in conjunction with other methods to detect desirable and undesirable changes occurring to vegetation as a result of land uses
Precipitation	Weather stations	Representative sample to detect precipitation patterns	Inches of precipitation	Monthly and annually	Precipitation insufficient for plant growth
Noxious Weed trend	Remote sensing or site visit	Area wide	Acres of established weeds and potential habitat areas	Continuously	Weed species are spreading or becoming established in new areas
Special Status Species	Site inspection	Special Status Species habitats	Population and trend	Annually	When there is a declining trend in populations
Wetland/Riparian Condition	Proper Functioning Condition (PFC)	Area wide	Stream miles and acres along with rating	Yearly, following the Standards and Guidelines (S&G) schedule for locations	Ratings below PFC, defined by the ability of the wetland site to maintain itself and for riparian areas to withstand a 2-year storm event

Indicator	Method or Technique	Location	Unit of Measure	Frequency and Duration	Action Trigger
Visual Resources					
Intrusions	Remote sensing or site visit	Class I and II areas	Impacts of an individual intrusion	Annually	When the intrusion exceeds the definition of the classification
Water Quality, Watershed, and Soils					
General water quality	Water sampling surveys using the Beneficial use Reconnaissance Program (BURP) Wyoming state protocol	Rivers and streams, locations selected to coincide with S&G schedule	Representative sample of water quality in standard units depending on parameter	Yearly, following the S&G schedule for locations	When quality does not meet state standards or water quality can be improved by BLM management actions
Surface water quality of water bodies listed on State 303d list as threatened or impaired	Sampling and monitoring design depends on parameters that required listing	Watersheds where water bodies are listed	Typically includes coordination with other agencies and a developed water monitoring program	Seasonally, during period when water body is listed	When trend in water quality is not toward improving conditions for delisting
Project-specific surface water quality	Sampling, modeling, and/or monitoring design depends on parameters that could be impacted from project actions	Surface waters that may be impacted by BLM management actions	Representative sample of water quality in standard units depending on parameter or modeling results	Seasonally, during period when water body may be impacted	When quality does not meet state standards or water quality can be improved by BLM management actions
Ground water quality	Ground water sampling	Where groundwater resources are used (stock watering or water supplies for campgrounds)	Representative sample of water quality in standard units depending on parameter	Varies by project when they are established and campgrounds monthly	When water quality does not meet needs for uses
Groundwater resources, potential impacted by resource development	Monitoring wells, sampling and modeling	Area wide	Depth to groundwater, water quality parameters	Monitoring wells may collect continuously, frequency and duration driven by project specifics	A significant environmental impact not considered or disclosed in the National Environmental Policy Act (NEPA) process

Indicator	Method or Technique	Location	Unit of Measure	Frequency and Duration	Action Trigger
Channel geometry	Riparian Cross Sections	Area wide	Change in stream channel (width, depth, side channel modification and bank sloughing	Every 1 to 3 years	When channel conditions could be improved by BLM management actions
Soil erosion uplands	Visual observation and surveyed erosion pins	Area wide where land use activities are occurring	Soil loss in tones per acre	Visually examination while land use activity is active and annually site surveys	When soil loss is accelerated beyond natural levels or beyond those considered or disclosed in the NEPA process
Soil erosion on stream banks and floodplains	Visual observation and surveyed erosion pins	Area wide where land use activities are occurring	Area affected in square feet or acres	Visually examination while land use activity is active and annually survey the site	Accelerated streambank soil loss
Soil compaction	Penetrometer or visual inspection	Area affected by land use activities	Pounds per square inch	1 to 2 times annually	Compaction restricts water infiltration and plant growth
Soil compaction, porosity, permeability, and depth to water	Monitoring wells (peizometers)	Riparian areas	Depth to water table	Every 2 to 3 years	Water table is shrinking beyond average precipitation fluctuations
Stream flow	Stream Gauging Stations	Area wide	Water volumes, times of flows, turbidity, pH, dissolved oxygen, and sediment loads	Monthly or during storm events	Trends indicate increased sediment load and deterioration in water quality
Wild Horses					
Horse numbers	Horse counts	Herd management areas	Number of animals	Annually	When numbers exceed established HML ranges
Horse blood	Blood sampling	Herd management areas	Blood analysis to determine animal health and genetic typing	When horses are gathered	Blood samples show deteriorating herd health or a genetic change
Wildlife and Fisheries					
Big game	Aerial and field	Crucial wildlife	Numbers during	Annually	Downward trend in animal occupancy

Indicator	Method or Technique	Location	Unit of Measure	Frequency and Duration	Action Trigger
seasonal habitat	inspections	habitat areas	occupancy periods		
Special Status Species occupancy and productivity	Air and site inspections	Habitat areas and established buffer zones	Numbers during occupancy periods	Annually	When there is a declining trend in populations
Threatened and Endangered species occupancy and productivity	Air and site inspections	Habitat areas and established buffer zones	Numbers during occupancy periods	Annually	When there is a declining trend in populations
Macroinvertebrate Indicator species	Collecting macroinvertebrate species	Perennial streams	Species and condition of macroinvertebrates	Every 2 to 10 years	When microinvertebrates that represent good quality water are not present in the stream
Neotropical bird habitat	Site visit	Area wide	Numbers during occupancy period	Every 2 to 3 years	Declining trend in habitat occupancy
Raptors	Site visit	Area wide	Nest occupancy rate	Every 2 to 5 years	Declining trend in nest site occupancy
Sage-grouse	Lek site visit	Lek sites	Number of male and females (occupied or unoccupied)	Annually	Declining trend in the number of males and females

APPENDIX 18—COMPENSATION (OFF-SITE) MITIGATION

Off-site or compensation mitigation would be used as a tool to address loss of habitat effectiveness when reclamation, Best Management Practices (BMP), and on-site mitigation measures are not adequate to mitigate the impacts of proposed actions.

The order of use of mitigation methods from most to least preferred would be as follows:

- On-site mitigation directly resolving impacts created by the action.
- Compensation mitigation to the resources affected by the action that cannot be resolved on site.
- Compensation mitigation to similar or related resources affected by the action that cannot be resolved on site.
- Compensation mitigation through the use of proponent-generated funds to a third party for use on same, related, or tangible benefits.

The following stipulations would apply to off-site mitigation measures:

- Compensation mitigation would be used as a last choice, not a first choice, when developing mitigation measures.
- Compensation mitigation proposals would describe the replacement or substitution activities or methods that would be used to address potential impacts to specific resources or environments or both.
- Compensation mitigation must be as close to "in kind" in replacement or substitution of resources, habitat function, or environments as practicable (e.g. elk habitat for elk habitat; historical properties for historical properties, etc) as possible.
- Compensation mitigation activities are to occur as near to the project or impacted area as possible or as scientific information and impact analysis suggests.
- Compensation mitigation practices must last as long as the impacts are expected to occur.
- Compensation mitigation cannot be in any form of monetary compensation directly made to the BLM.
- Compensation mitigation practices are to be developed, conducted or performed, and funded by the project proponent.
- Compensation mitigation activities must be conducted subject to BLM review and approval that the mitigations will actually address the impacts occurring on the public lands.

Thresholds

When a threshold is reached, off-site mitigation would be applied. Thresholds would generally be set at the point where disturbance in a specific area exceeds the level that would be tolerated by wildlife, or exceeds the physical capacity of an area to absorb or dampen the impact (for example, actions causing

surface runoff in excess of the capacity of soils to absorb or surface channels to carry without erosion of the channels). Threshold points for instigation of Office of Surface Mining (OSM) would include—

- Oil and gas development in excess of 16 surface well pad locations per 640-acre section. (See Oil and Gas Operations Appendix for information on surface disturbance, including roads, associated with typical well pads.)
- Physical long-term surface disturbance in excess of 80 acres per 640-acre section, or 12.5 percent of odd-sized or smaller sections.
- Disturbance to cultural resources (settings) when setting is an element of National Register status.

The first threshold reached would trigger the OSM requirement.

More thresholds could be developed throughout the life of the Resource Management Plan (RMP) as knowledge of impacts and mitigation technology is gained. Additional thresholds could address impacts such as acres of limited habitat types, amount of aspen disturbed; noise levels; human presence factors, like the number of vehicle trips in a specific area per day.

Options for specifics of compensation mitigation actions, including potential location of the compensating mitigation, methods, number of acres treated, etc. would be dependent on the proposed alternatives, and would be discussed at the implementation level, for example through project-level Environmental Impact Statements for oil and gas field development. Some site-specific impacts cannot be known until projects are physically implemented. For this reason, final compensation mitigation requirements may not be determined, in some cases, until after the impacting action has occurred.

APPENDIX 19—VEGETATION TREATMENTS, FOREST PRACTICES, AND RANGE IMPROVEMENTS

DESCRIPTION AND EFFECTS

Standard Operating Procedures

The Bureau of Land Management (BLM) Rawlins Resource Management Plan Planning Area (RMPPA) utilizes a variety of different best management practices (BMP) to manage vegetation communities and achieve multiple use objectives. Maintenance and improvement of the health of various vegetation communities is achieved through management prescriptions, including active treatments such as removing vegetation with fire, chemicals, biological or mechanical methods, planting or seeding vegetation, and grazing by various ungulates. This management focuses on the manipulation of selected components of the rangeland vegetation resource to meet predetermined multiple use landscape objectives. Descriptions of these management practices, including standard operating procedures and the desired effects of particular treatments, are described within this appendix.

Vegetation Treatments

All treatment projects would be subject to appropriate *National Environmental Policy Act* of 1969 (NEPA) compliance review. All prescribed burn projects would be designed with a burn plan and a smoke permit from the State of Wyoming's Department of Environmental Quality (DEQ), Air Quality Division, prior to implementation. Consultation with the interested public that would be affected, as well as an approved environmental analysis, would be required for all new vegetation treatment projects before any would be initiated. Each new vegetation treatment would be evaluated and examined in relation to multiple use objectives, including analysis of pretreatment and/or posttreatment grazing control measures, which would ensure that the management objectives of the project are met.

Pursuant to the policy of Wyoming BLM, prior to any vegetative treatment, a signed plan and/or agreement for grazing management would be in place. As a baseline, Wyoming BLM policy calls for deferment of livestock grazing on treated areas for two complete growing seasons, a period which may be adjusted to a lesser or greater time based on environmental conditions and/or management objectives consistent with Wyoming's *Standards for Healthy Rangelands*. Adjustments would be analyzed as separate alternatives in the original NEPA document prepared for the project and would be compared to the baseline alternative providing for two complete growing seasons of rest. Site-specific variables, such as project objectives, precipitation, soils, and/or plant communities, would be discussed.

Chemical treatments would consist of applying approved chemicals to meet plan objectives. Before chemicals are applied, BLM would comply with Department of the Interior regulations. All chemical applications would be preceded by an approved pesticide use proposal (PUP) and appropriate NEPA review. All applications would be carried out in compliance with label directions and the pesticide laws for Wyoming.

Permanent roads or vehicle routes (utilizing ground-disturbing methods such as blading) to new treatment sites or portions of treatment areas would be constructed only if necessary access does not exist or would not be gained by other project design features. Proposed vegetation treatments that would involve surface disturbance would be inventoried for archeological features that may be affected by the treatment. Any

identified archeological resource that would be adversely affected by the proposed treatment operation would be avoided or mitigated.

Proposed treatments would be inventoried for Special Status Plant or Animal Species. Treatments that would result in adverse impacts to BLM sensitive species would have mitigation measures incorporated into the project design features.

No action would be taken by BLM that would jeopardize the continued existence of any federally listed Threatened, Endangered, or Candidate plant and animal species. BLM would also comply with any state laws applying to animal or plant species identified by the state as being threatened or endangered (in addition to the federally listed species).

Design of Vegetation Treatments

Prescribed Fire Treatment Guidelines

Prescribed burning involves the use of fire under a predetermined set of conditions to change the character of the vegetative community. This technique takes advantage of a variety of parameters, including the relative fire tolerance and expected response of target and desired plant species, fire behavior characteristics, pretreatment and post-treatment grazing management, and climatic patterns to manipulate vegetation toward management objectives and goals. Prescribed burning would be useful in stratifying the overall age and structural class of vegetation; reducing fuel loads overall; inserting vegetational fuel breaks; improving watershed conditions within the project area and/or throughout a larger management block; and removing a dominant fire-sensitive overstory species, such as big sagebrush, thereby opening up the community to the natural response of fire-tolerant species. For more information on how BLM deals with prescribed fire in sagebrush, see Wyoming Guidelines for Managing Sagebrush Communities with Emphasis on Fire Management.

There are both direct and indirect impacts to vegetation from prescribed burns. These impacts center around first- and second-order fire effects (the obvious removal of vegetation [woody species and herbaceous cover] due to the fire, and recovery of certain vegetative species after fire) and the tertiary responses that are expected to occur to both riparian areas and uplands as a result of changes in ungulate grazing patterns expected after treatment. Depending on the type of vegetation targeted, the season and timing of the treatment, and the method of implementation, varying amounts of vegetation within the project area are removed by the treatment. Removal can range from virtually complete in the case of light herbaceous vegetation, to limited scorching in the case of heavy live fuels where varying degrees of "thinning" are desired. These same factors, as well as additional environmental parameters, influence what, where, and how much vegetation reestablishes after treatment, and what period of time would occur before the vegetation in the treatment unit returns to pretreatment conditions. Although the immediate effects of a prescribed burn are to reduce ground cover, wildlife habitat, and livestock forage, generally the long-term effects to vegetation include increased productivity, palatability, and species diversity (including type, amounts, and age classes).

Usually spring season prescribed burns are desirable when a lower ratio of burned/unburned vegetation and more of a broken mosaic pattern are preferred, such as treatments proposed in stands of critical seasonal wildlife habitat. Spring season prescribed burns would also be desirable to mitigate operational restrictions, such as the need for remaining snowbanks at higher elevations to control the perimeter of the project. Because of predominant climatic conditions within the RMPPA, spring cool season prescribed burns are designed with a much broader latitude of prescription parameters to achieve desired objectives, but because of the unpredictability of spring weather, the actual implementation window is usually a much shorter time period.

Late summer and fall season prescribed burns are usually undertaken in the RMPPA when objectives center around the removal of a larger amount and/or proportion of the target vegetation, or the treatment involves vegetation (such as aspen stands) that would most likely be untreatable during cooler and wetter periods. Because of more extreme environmental conditions during the late summer and early fall, there is less room for error when conducting and controlling these burn projects, therefore more constrictive prescription parameters are usually developed for these projects. The weather and environmental conditions are usually more stable and constant during the late summer/early fall season in the RMPPA, allowing for much wider operational periods than are found during the spring. Fall treatments usually require much more stringent control and holding measures than do those in the spring; in many cases they use artificial control lines and larger implementation crews. Constraints to implementation for fall season prescribed burns usually center around other land use activities (which tend to increase through the summer) and the lack of operational assets (as seasonal wildland fires consume resources, and personnel and equipment dwindle) rather than environmental restraints.

On a relatively limited basis, the RMPPA would engage in prescribed burn treatments which are independent of seasonality. These include the burning of slash piles from logging operations and/or mechanical treatment activities, usually prepared throughout the year (depending on accessibility) and implemented in the winter (when surrounded by snow), and also include broadcast burns in vegetation, where treatment objectives are independent of fire intensity. Broadcast burns take place throughout the year and mainly are dependent on operational resource availability.

Reseeding would be a viable technique to establish a more desirable plant community following treatment, however in most cases the techniques used and sites chosen would be those that lend themselves to natural regeneration wherever possible.

Unplanned wildland fires that occur in areas with an approved prescribed fire proposal and burn plan, including an approved Finding of No Significant Impact Decision Record (FONSI/DR), would be allowed to burn as long as they remain within the prescriptions and meet land use objectives.

Each alternative has identified the number of acres suitable for prescribed fire to achieve management objectives. Development of Allotment Management Plans (AMP) and other activity plans would further refine the acreage values according to livestock grazing, wildlife, and other resource objectives. Acreages of prescribed burns may increase or decrease on certain allotments depending on rangeland management needs as addressed in AMPs and other activity plans.

Chemical and Biological Treatment Guidelines

Chemical treatments involve the use of ground or aerially applied herbicides on target species to reduce their competitive effect on more desirable species. Many classes of herbicides exist, and all vary in action, selectivity, and persistence. However relatively few compounds are approved for use in broadcast-scale vegetation treatments on public lands. These compounds are usually selective for broadleaf vegetation, leaving only grasses, tolerant forbs, and shrub species after treatment. Chemical treatment and applications would be used only where control would be exercised to prevent unwanted loss of desirable flora or fauna and to prevent transportation of chemicals to other areas by water or air movement. Specific methods of application would be used for the control of noxious and invasive weeds, and for the manipulation of vegetation stands, to achieve management objectives. Methods of chemical treatment of vegetation near Special Status plant populations would be determined by BLM.

Noxious and invasive weeds would be treated in accordance with the Rawlins Field Office (RFO) Biological Noxious Weed Control EA (WY-037-EA6-123), Chemical Noxious Weed Control and Commercial Site Vegetation Control EA (WY-037-EA6-122) and Vegetation Treatment on BLM Lands

in Thirteen Western States (BLM, 1991). The grantee or lessee would be responsible for the control of all noxious and invasive weed infestations on surface disturbances within the limits of the disturbed areas.

Aerial application of chemicals would not be allowed within 1/4- mile of Special Status plant locations. An unsprayed buffer zone of 100 feet would be maintained near live or still water. Aerial spraying in riparian areas would not be allowed without prior approval of the authorized officer.

All chemical treatment sites for noxious and invasive weeds on rangelands would be reevaluated to ascertain the effectiveness of the treatment program. If retreatment is necessary, County Weed and Pest Supervisors, in cooperation with the BLM RFO would develop a retreatment program. All chemical treatment sites for noxious and invasive weeds on leases and rights-of-way (ROW) would be reevaluated by the lease/ROW holders or their contractor and the BLM Authorized Officer to ascertain the effectiveness of the treatment program.

Vehicle-mounted boom sprayers and hand sprayers would be used in nonriparian zones. Near water, a boom sprayer would be used only where feasible.

BLM would consider the invasion of noxious and invasive weeds in the design and implementation of grazing systems. Chemical treatment would minimize loss of desirable flora and fauna and avoid transportation of the chemicals off-site.

Biological treatment (insects, grazing animals) would be considered for weakening and limiting reproduction of target vegetation in critical riparian areas or areas with sensitive plants and animals, where application of chemicals or the use of fire is not feasible or desirable. Any insects or grazing animals used for vegetation treatment will have been carefully tested for host specificity, thereby reducing or eliminating possible adverse effects on nontarget vegetation. In addition, the use of biological treatments would be evaluated for compatibility with other multiple use objectives for the management area.

Mechanical Treatment Guidelines

As with prescribed fire and chemical or biological vegetation treatment, mechanical vegetation treatment will be considered for vegetation throughout the RMPPA to alter existing vegetation.

Mechanical treatments involve the use of mechanized equipment and/or some forms of manual labor to remove target vegetation or to consume the entire community and leave a suitable seedbed. Techniques and implements are highly variable, but all share the disadvantage of high cost. Mechanical treatment procedures range from use of machinery to remove and mulch large, coarse vegetation material (such as juniper, aspen, or heavy brush) to the use of chainsaws to remove noncommercial stands of overstory trees either partially (where thinning of target vegetation is desired) or completely by removing the target species from the project area in a stand replacement-type project. Mechanical treatment also includes mowing weedy species to prevent seed production. Small-scaled types of mechanical treatments, such as thinning target vegetation by means of chainsaw, usually require some type of follow-up treatment in the area to remove debris left from the operations. Follow-up treatments include stacking and removing commercial or otherwise usable materials, piling and subsequently burning slash materials, or broadcast burning of material on the ground to remove it from a desired seedbed. In addition, the use of agricultural mechanical equipment, such as towed brush-hog type machinery or plows, would be employed to treat suitable vegetation, where topography and finances allow.

An additional use of mechanical vegetation treatment centers around preparation for other treatments, primarily prescribed burning. Use of brush-hog or brush-beating equipment; tractors with plows; crews

with chainsaws removing high, above-ground fuels; or crews digging control lines to mineral soil by hand, are employed on a regular basis to make control of prescribed burns practical during the season of the project. These methods can be used to provide control lines independent of other operations or to provide a base-line from which "black-line," or control lines of burned vegetation, can be produced. When coupled with other treatment projects, these actions would involve site-specific environmental analysis and coordination with affected interests, completed during the NEPA analysis of the parent improvement project.

Grazing Management Prescriptions

Rangelands in the RMPPA are open to grazing by domestic livestock as per the *Taylor Grazing Act*, and therefore removal of portions of rangeland vegetation by grazing ungulates can be used as a vegetation management tool. Through AMPs, cooperative management plans, grazing agreements, and the permitted grazing preference in an allotment, the type, timing, seasonality, and duration of grazing use to rangeland vegetation can be managed. Primary tools center around managing livestock use on desirable rangeland species during their prime growth period. Summer cattle use (the predominant grazing use within the RMPPA) is the primary candidate for managed use patterns, as it tends to concentrate vegetation removal both during and after the growth stages of most forage species. Annual rotation, deferred rotation, rest rotation, split season, and dormant season grazing schedules remove pressure on the plants during at least a portion of their growth stage, and provide for uninterrupted growth and/or recovery periods.

The type of livestock permitted on specific rangelands can also be utilized to concentrate use on target species or, alternately, to remove all or a portion of grazing pressure from desirable species, depending on management objectives. Sheep use during the fall and winter, although including a significant portion of dormant herbaceous forage (when available), also includes a significant amount of rougher, woody, browse species, significantly more so than would be found with cattle use during the same period or with sheep use during other parts of the year. The use of sheep or goats during the early spring period, when target vegetation species are beginning to green up, can be utilized to increase the grazing pressure on certain weedy species, similar to the use of biological weed treatments. Such grazing treatments would be short-term and used on an annual basis, so as to pressure target species while leaving desirable species intact.

New grazing management techniques using alternate livestock types, grazing periods, and/or seasons of use, if different than the existing permitted use, would be examined on a case-by-case basis in relation to multiple use objectives, including site-specific environmental analysis and coordination with affected interests. If the type of proposed livestock and season of use is consistent with the existing grazing use permit or lease, no new NEPA analysis would be necessary.

Plantings of Vegetation

Live native vegetation common to a project site would be planted, usually in relatively smaller-scale projects. This type of treatment is utilized to stabilize soils and watersheds, particularly along stream banks or within lentic-type water systems. In many cases this type of treatment is applied to smaller-scale riparian area improvement projects, usually on sites that previously contained the target vegetation, which for one reason or another currently lack it. Riparian woody and grass-like species are procured from adjacent sites or from an outside source, transported to the specific project site, and planted by hand or with machinery. Subsequently the plantings are "encouraged" by allowing them to proliferate, free of season-long grazing pressure by livestock, wild horses, or wildlife. This can be accomplished through the use of exclosures to keep selected animals from the project; by utilizing rotational, shorter-duration, and/or seasonal grazing patterns with permitted livestock; or placing the plantings in less accessible sites.

When coupled with rangeland improvement projects (such as the construction of a dam or the development of a spring), these actions would be examined on a case-by-case basis in relation to multiple use objectives and would involve site-specific environmental analysis and coordination with affected interests, in most cases completed during the NEPA analysis of the parent improvement project.

Seedings of Vegetation

Used on a relatively limited basis within the RMPPA, native vegetation can be established (or reestablished) from seed in a variety of sites and situations. Usually employed to more quickly revegetate upland sites, this technique can be utilized on disturbed sites where vegetation has been mechanically removed, including reclamation projects such as well pads, pipelines, roads, and abandoned reservoirs, or in instances where vegetation has been lost as a result of a natural event, such as a wildland fire or flood. In addition, vegetation treatment projects, including prescribed fire, chemical treatments, and mechanical vegetation removal, can include reseeding of native upland plants following implementation, depending on a variety of factors (including environmental parameters, project objectives, or the nature/severity of the treatment). In most cases where more desirable vegetation is sought on a large-scale basis (such as watershed or sub-basin), other vegetation manipulation methods, described above, are the primary and most practical choice.

Seeding of upland vegetation can be accomplished through a variety of methods, including application by fixed- or rotary-winged aircraft, all-terrain vehicles, towed agricultural equipment (such as a rangeland drill), or manual labor. The method of application is totally site- and project-dependent, influenced by cost, terrain and topography, land use and/or political restrictions, and management objectives.

All the previously described vegetation manipulation techniques can be used to prepare a seedbed suitable for artificial reseeding. Where needed, reseeding is a viable technique to establish a more desirable plant community. However seed and application costs can be high and are sometimes difficult to prove cost-effective. As noted previously in the Prescribed Fire section, BLM in the RMPPA strives to design vegetation treatments that will not require reseeding of native vegetation. However, reseeding can be a viable alternative in specific situations, depending on management and/or project objectives. Prescribed fire projects can be useful in preparing a seedbed for artificial seeding, although the nature of the project and the type of burn utilized will influence the need or practicality of subsequent seeding operations. Although chemical treatments can have less total initial impact to the project site than burning or mechanical treatments, the seedbed resulting from a chemical treatment is usually not as suitable for reseeding because of the amount of standing litter. Mechanical treatments, especially those resulting in a high degree of surface disturbance, such as chaining or plowing, usually produce a highly receptive seedbed. Manually applied mechanical treatments, such as thinning or stand-replacing projects, can require some type of intermediate treatment, such as burning of slash piles prior to applying seed mixtures.

In many cases the most economical and feasible seeding mixtures (i.e., those with the most probability of success) involve perennial native grasses and forbs. On special habitat such as mule deer crucial winter range, where disturbance has occurred and reclamation is necessary, or where upland seedings are proposed for specific management objectives, the mixtures could include a variety of high-quality shrub seedlings, such as winterfat, shadscale, four-wing saltbush, and, in certain instances, mountain mahogany and antelope bitterbrush, to complement the usual grass mixture. Shrub mixtures are usually much more expensive, and the success of establishment can be variable—highly dependent on the condition of the seedbed. Exclusion of wild horses and livestock, and possible reseeding operations, may be required in severely unstable watersheds, although the large scale and resulting high expense of this type of management usually makes it prohibitive. Because of terrain irregularities and topographical features,

vegetation treatments are usually irregular in shape, providing for edge effect, cover, and visual aesthetics.

As with other treatment methods, upland seedings would be examined on a case-by-case basis in relation to multiple use objectives and would involve site-specific environmental analysis and coordination with affected interests. In the cases of seeding projects coupled with other projects, including reclamation or rehabilitation projects, the examination is completed during NEPA analysis of the parent development.

Design of Range Improvements

All range improvements will be designed and constructed in a manner to minimize environmental impacts while maximizing function and cost-effectiveness. Prior to the installation of any range improvements, an environmental assessment (EA) will be prepared, analyzing the alternatives for the project. Whenever possible, water will be provided to benefit the seasonal needs for wildlife.

Springs and Seeps

Spring and seep water sources are usually developed by collecting the water using a perforated pipe and/or head box, diverting the water into a drinking trough. The source is usually fenced for protection of the soils and the vegetation around it. During most of the year, spring and seep sources run freely (not through a trough) and maintain the riparian system. When water is run to a trough, the overflow water would be piped back to the original drainage course.

Troughs

Troughs are an integral part of many water developments. They are used in conjunction with spring and seeps, wells, pipelines, and off-site waters below reservoirs. They come in various shapes and sizes, however the most common styles include large tires; Powder River troughs; fiberglass; aluminum; and concrete-bottom, metal-sided tanks. All troughs require some type of escape route for small birds and mammals, with a wire/concrete ramp or rock pile most commonly used. The overflow water would be piped back to the original drainage course.

Wells

Wells are usually drilled in areas where other water sources are unavailable, to provide a reliable water source for livestock and wildlife. Power sources for pumps may include generators, windmills, solar panels, or electrical hookups to power lines. The facility could be designed with a water storage tank at the well or at a location where pipelines would gravity-feed water to other sites. Drinking troughs may be installed near the well and/or at various locations from a pipeline. Well sites will be selected based on geologic well site investigations.

Water Pipelines

Pipelines consist of plastic—usually polyethylene—or steel pipe that is buried by mechanical pipe-laying implements or laid on the soil surface. Pipelines designed for spring through fall use are usually placed 12 to 18 inches below the surface, as compared to winter pipelines that are 5 to 6 feet deep. Pipelines originate at creeks, wells, or spring/seep sources and are used to distribute water to otherwise nonserviced areas. Drinking troughs, and in some cases a storage tank, are situated along the pipeline.

Reservoirs

Reservoirs are constructed across drainages by building a dike to store water, with an overflow pipe and spillway to pass excess streamflow or high-flow events. Pit-style reservoirs are constructed on small side drainages and basins without a pipe, where the spillway directs excess water into a neighboring draw or gentle terrain. The impoundments created are designed to catch temporary runoff or permanent streamflow to provide a more reliable source of water for livestock and wildlife. Design requirements are determined mainly by the nature and amount of source water. Where there are opportunities to create reservoirs of sufficient size and depth to support fisheries, more specific livestock management may occur, including fencing off the reservoir and providing off-site watering facilities (troughs).

Fences

Fences are constructed to provide livestock management boundaries. They provide interior pastures or boundaries for grazing allotments. Because of different management considerations, fence design is highly variable (see BLM Manual Handbook 1741-1, Fencing). Wire may be smooth, barbed, mesh, or a combination, depending on the type of project and/or livestock species involved. Exclosure fences may be built to restrict livestock (and in some cases wildlife) access to sensitive areas. Wooden braces are usually spaced 1/4-to 1/2-mile apart, or closer if necessary. Line posts may be steel, wood, or fiberglass, with spacing based on the fence type, topography, and resource objectives. Electric fences may also be used in some instances. Because of the potential for impact to wildlife movement, portions of historic woven wire fences are identified for modification.

Cattleguards

Cattleguards will be installed where fences cross heavily traveled roads or in situations where opened gates would severely compromise management. Cattleguards are generally 8 feet wide, and vary in length depending on traffic needs.

Instream Structures

Instream structures are primarily steel sheet-piling, gabions, or check dams of rock, logs, or concrete and steel placed in streams and ephemeral draws to maintain water tables, slow water flow, and reduce erosion.

FOREST MANAGEMENT

Forestry Program

Overview

This appendix was developed to supplement the discussion of forestry in chapters 1 through 4 by providing more information about forest resources and the forestry program within the RMPPA.

The forestry program within the RMPPA is directed at managing the forested lands in a healthy and productive manner. Forest management activities include timber sales and harvests; site preparation for tree regeneration; forest stand improvement through commercial and precommercial thinnings; forest inventory surveys; tree planting; and forest health improvements through biomass removal, hazardous fire fuels reductions, and close observation of insect and disease problem areas.

Silvicultural Practices

Silvicultural practices are on-the-ground activities used to influence the establishment and/or growth of forest stands. The major silvicultural practices used in the RMPPA are described in the following sections, including their applicability and use.

Regeneration

Regeneration refers to the reforestation process, in which trees in an area are reestablished. The term also can refer to the tree seedlings that become established in the area.

In areas where the existing tree cover has been totally or partially removed by natural or artificial causes, natural or artificial regeneration may be used. In natural regeneration, the area is allowed to reforest itself through the use of seeds left on the site, seeds blown into the site from adjacent forests, or a process called root suckering. Natural regeneration requires proper seedbed preparation, a good seed crop, and cooperating weather. The majority of forest tree species common to the RMPPA are more acceptable of this method of regeneration.

Artificial regeneration is carried out by the forester, who places seeds on or in the ground or plants tree seedlings. Artificial regeneration can be used to reestablish tree growth to an area in a shorter time, to convert a site from one tree species to another, or to provide a means of regeneration if natural regeneration fails. For commercial timber stands after a timber harvest, artificial regeneration can be used to supplement natural regeneration to achieve a desired stocking level or to improve the genetic stock in an area. (This is usually economically unfeasible for the RMPPA.)

Stand Development

The stand development period is the time from which the forest stand was established (regeneration) to the time the forest stand is harvested or dies from natural progression. Silvicultural practices are performed during this period to improve a forest stand's health and growth, to help reduce insect and disease infestations, or to achieve other management objectives if the area is being managed for multiple uses. Common stand development activities are precommercial and commercial thinning.

Thinning is a procedure used to reduce the number of trees per acre so that stagnation of growth is prevented and the overall stand health and growth is improved. This activity leaves a specified number of trees per acre at a desirable spacing. Thinning also can be used to help slow the spread of dwarf mistletoe and outbreaks of mountain pine beetle.

Precommercial thinning is used when a forest stand is in need of thinning at an immature age (from seedling to between 8 and 10 years of age). Little merchantable product can be attained through precommercial thinning. When required, a forest stand may be precommercially thinned through the public sale of Christmas trees (only during December). In most cases, however, BLM will perform the thinning in-house through its BLM Fire Fuels Crew or through hire of a professional contractor. In precommercial thinning, a 10- to 15-foot spacing is left between stand trees to allow for maximum growth production.

Commercial thinning is used when a forest stand has reach a diameter at breast height (DBH) average of 5 to 6 inches and an average height of 25 to 30 feet, or a merchantable post and pole size. In such cases a forest stand may be commercially thinned by the public sale of post and poles. In most cases, however, BLM will sell the materials to a willing individual buyer among the public or to a professional contractor

through a post and pole sale. In commercial thinning, a 15- to 20-foot spacing is left between standing trees to allow for maximum growth production.

Harvesting

Several methods of harvesting are used in the RMPPA.

Clear-cutting

Clear-cutting is a method of harvesting in which all the trees in a designated area are cut down. This method is used for forest stands that require complete removal of the overstory because of poor health; damage from the wind, including blow-down; damage from other natural events, such as wildland fire; or the regeneration requirements of a particular tree species.

Regeneration of clear-cut stands may be accomplished through natural or artificial means. As a general rule, clear-cutting is the harvest method with the lowest logging cost per thousand board feet (MBF); the fewest miles of temporary road used or built per MBF; and potentially the most adverse impacts to the soil, water, wildlife, and visual resources over the long term.

Select Tree Cut

In a select tree cut, trees within a particular stand are individually marked for cut and harvest. Selection criteria can be based on size, species, or individual tree health. This type of cut is commonly used to improve stand health and growth production in mature forest stands. Select tree cutting involves accurate tree felling and minimal skidding, which allows for fewer environmental impacts.

Slash Disposal

Slash comprises the tops, limbs, and other unusable portions of trees, left in an area after harvesting. Two methods of slash treatment are described in the following section.

Lop and Scatter

Lop and scatter is a slash treatment method in which the tops and large branches of trees are cut so that the slash will be at a predetermined height off of the ground. This method is used in areas where the amount of slash is light. It allows for a speedy natural decomposition process.

Pile and Burn

The pile and burn method of slash treatment is used in areas where tree species need an exposed mineral soil seedbed for successful seed germination. The dominate tree species within the RMPPA, lodgepole pine, needs such a seedbed. After harvesting, the slash is pushed up into pile, usually with a bulldozer. This process exposes the mineral soil seedbed needed for successful seed germination of lodgepole pine. Not all the slash is piled however. About 30 percent is left scattered over the area as protection for newly regenerated seedlings. The slash piles are later burned in the winter, when a protective layer of snow allows for safe burning.

The pile and burn method is also used to dispose of undesirable or non-merchantable woody materials collected in forest health projects such as stewardship projects and hazardous fire fuels reduction projects. In addition, it is used to dispose of slash from precommercial and commercial thinnings. These slash piles also are burned in the winter, when a protective layer of snow allows for safe burning.

Management Direction for Forests and Woodlands

Forests and woodlands are categorized as lands available for intensive management of forest products, for restricted management of forest products, for management to enhance other uses, and lands not available for management of forest products. These four categories are described in the following section.

Intensive Management

Lands available for intensive management of forest products are areas where forest management is one of many uses, but where other uses or resource values are not emphasized. These lands are managed to achieve a highly productive forest by implementing forest management activities to enhance overall forest health and growth production. Commercial timber activities are concentrated within these areas.

Lands placed under this category are commercial forestlands that have the least amount of conflicts with other resource programs.

Restricted Management

Lands available for restricted management of forest products are areas where other uses or resource values are emphasized and limited forest management activities are allowed. Forest products in the form of timber can be harvested from such lands, but harvesting methods such as clear-cutting is completely restricted.

Lands in this category are areas with steep slopes and riparian areas located within a forested area.

Enhancing Other Uses

Lands where the forests are managed to enhance other uses are areas where forest management is tailored to benefit other identified resource values or uses. Such management practices are used on the woodland areas within the RMPPA, which contain aspen and other noncommercial tree species. Forest management activities such as the harvesting of small or minor wood products can be carried out on these lands to a limited degree. Management activities would be for the benefit of other resources or to respond to requests from the public—usually for firewood, posts and poles, Christmas trees, and wildlings.

Decadent aspen stands located on these lands may also be manipulated to allow for new vigorous sapling growth to enhance the stand, as well as to provide browse for big game.

Not Available for Forest Management Activities

Lands not available for management of forest products are areas of commercial forestland that have been withdrawn from the lands available for forest management activities. Forest management activities have been excluded from such lands because these lands have been determined to have other resource values of importance, on which severe impacts would result from forest management activities. These areas include Wilderness Study Areas (WSA), historically protected areas, and wild and scenic river areas.

Monitoring

Monitoring of a stand generally begins 1 year after the stand's harvest. Continued monitoring is made on a scheduled basis over the next 3 to 5 years to make sure the stand's regeneration is adequate. Monitoring over the following 20 to 60 years will be performed to establish the suitability for precommercial and

commercial thinning to prepare the stand for possible harvest as a commercial timber product when it reaches maturity.

Monitoring is also performed on individual forest stands to observe forest health conditions to help control the spread of insect and disease outbreaks.

LITERATURE CITED

BLM, 1991. *Vegetation Treatment on BLM Lands in Thirteen Western States, Final Environmental Impact Statement.* BLM-WY-ES-91-022-4320. USDI-BLM, Wyoming State Office, Cheyenne, WY.

APPENDIX 20—OIL AND GAS OPERATIONS

GEOPHYSICAL EXPLORATION

Oil and gas can be discovered by either direct or indirect exploration methods such as the mapping of rock outcrops, seeps, borehole data, and remote sensing data. In many cases, indirect methods, such as seismic, gravity, and magnetic surveys are required to delineate subsurface features that may contain oil and gas. Geophysical exploration may provide information that increases the chances of drilling a discovery well and also information that may discourage drilling and the associated surface disturbance. More sophisticated geophysical techniques, like three dimensional seismic surveys, may supply enough information to model a reservoir and optimize drilling to prevent excess wells and the associated surface disturbance.

Gravity Surveys

Gravitational prospecting detects micro-variations in gravitational attraction caused by the differences in the density of various types of rock. Gravity data are used to generate anomaly maps from which faults and general structural trends can be interpreted. These surveys are generally not considered definitive because of the many corrections required (e.g., terrain, elevation, latitude, etc.) and the poor resolution of complex subsurface structures. The instrument used for gravity surveys is a small portable device called a gravimeter. Generally measurements are taken at many points along a linear transect, and the gravimeter is transported either by backpack, helicopter, or off-road vehicle. The only surface disturbance associated with gravity prospecting is that caused by a vehicle, if used.

Geomagnetic Surveys

Magnetic prospecting is most commonly used for locating metallic ore bodies but is used to a limited extent in oil and gas exploration. Magnetic surveys use an instrument called a magnetometer to detect small magnetic anomalies caused by mineral and lithologic variations in the earth's crust. These surveys can detect trends in basement rock and the approximate depth to those basement rocks but in general they provide little specific data to aid in petroleum exploration. Many corrections are required to obtain reliable information. The generated maps lack resolution and are considered rudimentary views of subsurface geology. Magnetometers vary greatly in size and complexity, and in general, most magnetic surveys are conducted from the air by suspending a magnetometer under an airplane. Magnetic surveys conducted on the ground are nearly identical to gravity surveys and surface disturbance is minimal to nonexistent.

Seismic Reflection Surveys

Seismic prospecting is the best and most popular indirect method used for locating subsurface structures and stratigraphy that may contain hydrocarbons. Seismic energy (shock waves) is induced into the earth using one of several methods. As these waves travel downward and outward, they encounter various rock strata, each having a different seismic velocity characteristic. As the wave energy encounters the interface between rock layers where the lower layer is of lower seismic velocity, some of the seismic energy is reflected upward. Sensing devices, commonly called geophones, are placed on the surface to detect these reflections. The geophones are connected to a recording truck that stores the data. The time required for the shock waves to travel from the shot point down to a given reflector and back to the geophone is related to depth, and this value is mapped to give an underground picture of the geologic structure.

There are many methods available today that an explorationist can use to induce the initial seismic energy into the earth. All methods require preliminary surveying and laying of geophones. The thumper and vibrator methods pound or vibrate the earth to create a shock wave. Usually large trucks are used, each equipped with vibrator pads (about 4-foot square). The pads are lowered to the ground, and vibrators on all trucks are triggered electronically from the recording truck. Information is recorded and then the trucks move forward a short distance and the process is repeated. Less than 50 square feet of surface area is required to operate the equipment at each test site. The trucks are equipped with large flotation type tires, which reduce the impact of driving over undisturbed terrain.

The drilling method uses truck-mounted drills that drill small-diameter holes to depths of 100 to 200 feet. Four to 12 holes are drilled per mile of line. Usually, a 50-pound charge of explosives is placed in the hole, covered, and detonated. The detonated explosive sends a shock wave below the earth's surface that is subsequently reflected back to the surface from various subsurface rock layers. In rugged topography, a portable drill is sometimes carried in by helicopter. Charges are placed in the hole as is done in a truck-mounted operation. Another portable technique is to carry the charges in a helicopter and place the charges on wooden sticks, or lath, about 3 feet above the ground. Usually, 10 charges in a line are detonated at once. In remote areas where there is little known subsurface data, a series of short seismic lines may be required to determine the subsurface geology. Subsequently, more extensive seismic lines are arranged obtain the greatest amount of geologic information.

Seismic information can be obtained in two (2D) or three (3D) dimensional configurations. To obtain 3D seismic information, the seismic sensors and energy source are located along lines in a grid pattern. This type of survey differs from the more common 2D surveys because of the large volume of data and the intensive computerization of the data. The results are expensive to obtain but give a more detailed and informative subsurface picture. The orientation and arrangement of the components in 3D seismic surveys are less tolerant of adjustments to the physical locations of the lines and geophones, but they are also more compact in the area they cover. Although alignment can be fairly critical, spacing of the lines can often be changed to significantly increase the information collected. The depth of the desired geologic information will dictate the spacing of the grid lines, with smaller spacing detailing shallower formations. The 3D surveys are very expensive and usually conducted after 2D surveys or drilling has delineated a geologic prospect that will justify the extra cost. Extensive computer processing of the raw data is required to produce a useable seismic section from which geophysicists can interpret structural relationships to depths of 30,000 feet or more. The effective depth of investigation and resolution are determined to some degree by which method is used.

A typical drilling seismic operation can use 10 to 15 men operating 5 to 7 trucks. Under normal conditions, 3 to 5 miles of line can be surveyed each day using the explosive method. The vehicles used for a drilling program include several heavy truck-mounted drill rigs, water trucks, a computer recording truck, and several light pickup trucks for the surveyors, shot hole crew, geophone crew permit man, and party chief.

Public roads and existing private roads and vehicle routes are used. Off-road cross-country travel may be necessary to carry out tasks. Motor graders and (or) dozers may be required to provide access to remote areas. Concern about unnecessary surface disturbance has caused government and industry to more carefully plan surveys. As a result, earth-moving equipment is now only rarely used in seismic exploration work. Several trips a day are made along a seismograph line; this usually establishes a well-defined two-track vehicle route. The repeated movement back and forth along the line (particularly the light pickup trucks) defines the vehicle route. Spreading vehicles out so that vehicle routes are not straight, and vehicles do not retrace the same route has in some cases prevented the establishment of new vehicle routes and has reduced impacts. Drilling water, when needed, is usually obtained from the nearest source.

Each of the foregoing exploration methods has inherent strengths and weaknesses, and explorationists must decide which method is the most practical with regard to surface constraints (such as topography) but will still produce useful information. Economics and past information also plays a role in determining the method used. Reconnaissance type surveys of gravity and geomagnetic can be run in areas where little information is available with the attendant lower costs and less impacts. More expensive and higher impact seismic surveys are run when more detailed information is required.

GEOPHYSICAL MANAGEMENT (PERMITTING PROCESS)

Geophysical operations on and off an oil and gas lease are reviewed by the appropriate federal surface management agency (SMA) (i.e., Bureau of Land Management [BLM], Bureau of Reclamation, or U.S. Forest Service). Good administration and surface protection can only be accomplished through close cooperation between the operator and the affected agency. Over a 10-year period (from 1994 through 2003) the Rawlins Resource Management Plan Planning Area (RMPPA) has processed 40 seismic exploration notices or permits (see Table A20-1) on public lands. An average of four notices or permits can be expected to be processed in any year.

Table A20-1. Seismic Exploration Permits on Public Lands

Year	Number of Permits Approved
1994	1
1995	1
1996	1
1997	4
1998	5
1999	11
2000	5
2001	3
2002	5
2003	4
TOTAL	**40**

The responsibilities of the geophysical operator and the Field Manager are as follows (USDI 1989b):

- **Geophysical Operator**—An operator is required to file with the Field Manager a "Notice of Intent to Conduct Oil and Gas Exploration Operations." The "Notice of Intent" shall include a map showing the location of the line, all access routes, and ancillary facilities. The party filing the "Notice of Intent" shall be bonded. A copy of the bond or other evidence of satisfactory bonding shall accompany the Notice. For geophysical operation methods involving surface disturbance, a cultural resources survey is also required. A pre-work field conference may be conducted. Earth-moving equipment shall not be used without prior approval. Upon completion of operations, including required rehabilitation, the operator is required to file a "Notice of Completion of Oil and Gas Exploration Operations."
- **Field Manager**—The Field Manager shall contact the operator after the "Notice of Intent" is filed and apprise the operator of the practices and procedures to be followed prior to commencing operations on BLM-administered lands. After the operations are completed, as specified by the "Notice of Completion," the Field Manager shall complete a final inspection and notify the operator if the terms and conditions of the "Notice of Intent" have been met or that additional action is required. Consent to release the bond or termination of liability shall not be granted until the terms and conditions have been met.

State Standards

In Wyoming, the operator is required to register with the Wyoming Oil and Gas Conservation Commission (WOGCC). WOGCC standards for plugging shot holes, personnel safety, etc., will be followed as specified in a memorandum of understanding (MOU) between the BLM and the State of Wyoming WOGCC, dated September 13, 1994, BLM MOU WY920-94-09-79. The MOU was entered into by and between the BLM and the WOGCC in accordance with Federal Land Policy and Management Act (FLPMA).

Mitigation

Seasonal restrictions are imposed to reduce conflicts with wildlife, watershed damage, and hunting activity.

The most critical management practice is compliance monitoring during and after seismic activity. Compliance inspections during the operation ensure that stipulations are being followed. Compliance inspections upon completion of work ensure that the lines are clean and the drill holes are properly plugged.

OIL AND GAS LEASING

The Mineral Leasing Act provides that all public lands are open to oil and gas leasing unless a specific order has been issued to close an area. Based on the Federal Onshore Oil and Gas Leasing Reform Act of 1987, all leases must be exposed to competitive lease sales. Lands for which bids are not received at the lease sale, will be available for noncompetitive leasing for a period not to exceed 2 years. Competitive sales will be held at least quarterly and by oral auction. Competitive and noncompetitive leases are issued for a term of 10 years or for as long as oil and/or gas are produced. The Federal Government receives yearly rental fees on non-producing leases. Royalty is received at the rate of 12-½ percent of the total saleable production, one half of which is returned to the State of Wyoming.

Lease stipulations may be attached to each parcel and become part of the lease after sale. Initially, stipulations are attached to a parcel by the state office leasing section from various databases. The parcel list is segregated and sent to the field office that has the majority of the parcel lands in its area. In the field office, the parcel is reviewed by a group of resource and National Environmental Policy Act (NEPA) specialists to ensure that lands are in conformance with the Resource Management Plan (RMP), the stipulations are correct, and that any missing stipulations are included. This completes the process and allows the parcel to be included in a sale package.

The authorized officer has the authority to relocate, control timing, and impose other mitigation measures under Section 6 of the Standard Lease Form. This authority is invoked when lease stipulations are not attached to the lease or new resources are discovered on a lease. Lease stipulations are conditions of lease issuance that provide protection for other resource values or land uses by establishing authority for delay, site changes or the denial of operations within the terms of the lease contract. These stipulations adhere to the Uniform Format for Oil and Gas Lease Stipulations prepared by the Rocky Mountain Regional Coordinating Committee in March 1989. The stipulations are specified for each applicable parcel in the Notice of Competitive Oil and Gas Lease Sale and are intended to inform interested parties (potential lessees, operators) that certain activities will be regulated or prohibited unless the operator and the SMA arrive at an acceptable plan for mitigation of anticipated impacts. These stipulations are attached to the whole lease, regardless of whether the protection measure is only be in a specific portion of the lease. Lease stipulations are based on the perceived resource requirements and land uses as specified in NEPA

documentation. New science, comprehensive documentation of resource requirements, land pattern interference, and ongoing monitoring of the effectiveness of a stipulation may allow granting of a waiver, exception, or modification to a stipulation. A lease stipulation *waiver* is a permanent exemption to a lease stipulation. An *exception* is a one-time exemption to a lease stipulation and is determined on a case-by-case basis. A *modification* is a change to the provisions of a lease stipulation either temporarily or for the term of the lease.

DRILLING PERMIT PROCESS

A federal lessee or the operator of record is governed by procedures set forth by the Onshore Oil and Gas Order No. I, "Approval of Operations on Onshore Federal and Indian Oil and Gas Leases," issued under 43 CFR 3164. These procedures cover the full gamut of operations on federal minerals, from initial permitting of the well, to subsequent operations, to final abandonment. In the initial permitting process, the operator selects the location of a proposed drill site. This selection is based on WOGCC spacing requirements, the subsurface geology, the topography, and the avoidance of known protected surface resource values.

Spacing requirements are established by the WOGCC to protect the correlative rights of offsetting mineral owners and efficiently recover the resource. This applies to all mineral ownership, i.e., fee, state, and federal minerals. The spacing requirements are considered to be located at the subsurface point of production. Wells must be drilled within 200 foot of the center of a legal subdivision, such as a quarter section, depending on the spacing assigned to the particular area. A proposed location may be moved beyond the designated tolerance by a spacing exception granted by WOGCC. A spacing exception requires notification of the offsetting mineral lease owners and if there is a protest, the matter must be presented at a public hearing with full evidence of the need to relocate the well before a decision can be made by WOGCC. The RMPPA has a specified spacing density of 160 acres throughout most of the high and moderate potential areas. The rest of the RMPPA is spaced at 40 acres, which is the standard statewide rule. Forty acres is not a probable future spacing, except in specific instances, because spacing is based on the most efficient recovery of the reserves. The probable maximum subsurface density of wells is 160 acres throughout most of the RMPPA, with certain areas having a subsurface density of 80 acres based on the currently projected recovery efficiencies and economics. Spacing of 640 acres or 1,280 acres per well is not unrealistic in the case of deep, expensive wells that can recover the reserves in an efficient manner. Surface density of wells would be a variable based on the surface resource conflicts, economics of directional drilling, accessibility within the checkerboard (surface locations on fee land to access federal minerals within resource conflict areas), and the subsurface density.

Occasionally, BLM may require that a lessee drill a well on a lease if it is determined that federally owned minerals are being drained by an adjacent well on private or state owned lands. This may cause conflicts in areas of sensitive surface resources. If the economics are not sufficient to drill a directional well from a location on the federal lease, drainage protection may require compromising the sensitive surface resource after a thorough environmental review.

Permitting

After the operator makes a decision to drill a well, the well, access road, and pipeline can be surveyed and staked without notice to BLM. Cultural resource inventories can also be obtained without notice.

- **Notice of Staking (NOS)**—After the operator makes the decision to drill a well, it must decide whether to submit an NOS or APD. The NOS is an abbreviated notice that consists of an NOS form, a staked location map, and sketched site plan. This notice is posted for a 30-day public

review and begins the processing time frame for approval of the APD. The NOS triggers the on-site inspection of the well, which determines whether any conflicts with critical resource values are evident and provides the preliminary data to assess what additional items are necessary to complete the APD.

- **Application for Permit to Drill (APD)**—The operator can submit a completed APD in lieu of an NOS, but in either case, no surface disturbing activity can be conducted in conjunction with the drilling operations until the APD is approved by the Field Manager.

If the APD option is used, an APD is submitted to the Field Manager and a field inspection is held with the operator and any other interested party. The purpose of the on-site field inspection is to evaluate the operator's plan, to assess the situation for possible impacts (surface and subsurface), and to formulate resource protection stipulations. To lessen environmental impacts, a site can be moved, reoriented, or resized, within certain limits, at the on-site inspection. The proposed access road or pipeline can also be rerouted. If necessary, site-specific mitigations are added to the APD as Conditions of Approval (COA) for protection of surface and/or subsurface resource values in the vicinity of the proposed activity.

The Field Office is responsible for preparing environmental documentation necessary to satisfy the NEPA requirements and provide any mitigation measures needed to protect the affected surface resource values. Consideration is also given to the protection of subsurface water resources. When processing an APD, the BLM geologist is required to identify the maximum depth of usable water as defined in Onshore Oil and Gas Order No. 2. Usable water is defined as that water containing 10,000 parts per million or less of total dissolved solids. Water of this quality is to be protected usually by surface casing and cement. Determining the depth to fresh water requires specific water quality data in the proposed well vicinity or geophysical log determination of water quality, depending on existing well proximity and log availability. If water quality data or logs from nearby wells are not available, the area within a 2-mile radius of the proposed well is checked for water wells. If wells exist, surface casing is required to be set below the deepest fresh water zone found in these wells or to be placed below a depth reasonably estimated for future water wells. In the RMPPA, usable water can be available to great depths and beyond the surface casing setting point. In this case, surface casing is set through the fresh surface waters, and cement is required to protect the remaining useable water from the underlying non-useable water. The depth of the casing is specified to be below a depth reasonably anticipated for future useable water recovery.

When final approval is given by BLM, the operator can commence construction and drilling operations. Approval of an APD is valid for 1 year. If drilling does not begin within 1 year, the stipulations can be revised prior to extending the APD for another year.

Economic conditions dramatically affect drilling activity and at the present time oil and gas markets are buoyant nationwide. However, a downturn in the petroleum market could create a significant decrease in the number of drilling wells within the RMPPA because much of the current activity is infill drilling or in marginal fringe areas. Lower prices could potentially reduce the number of coalbed natural gas (CBNG) wells drilled because of the higher cost of these operations. Increases in activity have occurred over the past 3 years because of increased interest in obtaining gas to supply the Kern River gas pipeline to California and uncharacteristically high gas prices. The RMPPA approved 104 drilling applications in fiscal year 2000, 173 in 2001, 191 in 2002, and 183 in 2003. An approximately equal number of fee and state wells are also usually approved.

In the RMPPA, drilling depths range from a few thousand feet in the Atlantic Rim CBNG area to more than 17,000 feet in the Washakie and Hanna basins. The vast majority of the wells drilled in the resource area require 30 to 90 days to drill and complete. Some of this time may be consumed with waiting for pipeline connections so that a "green completion" can be made. A green completion allows wells to sell

gas during the early clean-up phases of the stimulation program. In the past, a lot of gas was vented or flared during this clean-up phase. Some deep wildcat wells (17,000 to 20,000 feet) may require a year or more to drill and complete.

Surface Disturbance Associated With Exploratory Drilling

Upon receiving approval to drill the proposed well, the operator moves construction equipment over existing roads to the point where the access road will begin. Generally, the types of equipment include dozers (track-mounted and rubber-tired), scrapers, and motor-graders. Moving equipment to the construction site requires moving several loads (some overweight and over width) over public and private roads. Existing roads and vehicle routes are improved in places and occasionally culverts and cattle guards are installed as specified in the approved APD.

The length of the access road varies. Generally the shortest feasible route is selected to reduce the haul distance and construction costs. Environmental factors or the landowner's wishes may dictate a longer route. In rough terrain, the type of construction is sidecasting (using the material taken from the cut portion of the road to construct the fill portion); slightly less than one-half of the roadbed is on a cut area and the rest is on a fill area. Roads are usually constructed with a l4-foot (single lane) or 24-foot (double lane) running surface (in relatively level terrain). Soil texture, steepness of the topography, and moisture conditions may dictate surfacing the access road. The total acreage disturbed for each mile of access road constructed varies significantly with the steepness of the slope.

Well locations are constructed by one of three different general types of construction, but in every case, all soil material suitable for plant growth is first removed and stockpiled in a designated area. Sites on flat terrain usually require little more than removing the topsoil material and vegetation. Drilling sites on ridge tops and hillsides are constructed by cutting and filling portions of the location. The majority of the excess cut material is stockpiled in an area that will allow it to be easily recovered for rehabilitation. It is important to confine extra cut material in a stockpile rather than cast it down hillsides and drainages where it cannot be recovered for rehabilitation.

The amount of level surface required for safely assembling and operating a drilling rig varies with the type of rig, and the depth and type of the well. The amount of level surface required averages 300 by 400 feet and should be constructed so that the drill rig can be placed on the cut surface instead of fill material to prevent the derrick from leaning or toppling as a result of the settling of uncompacted soil.

In addition to the drilling rig footprint, a reserve pit is constructed, usually square or oblong, but sometimes in another shape to accommodate topography. Generally, the reserve pit is 8 to 12 feet deep, but may be deeper to compensate for smaller length and width or deeper drilling depths. Depending on the relationship of the location to natural drainages, it may be necessary to construct water bars or diversions. The area disturbed for construction depends largely on the steepness of the slope. Depending upon the soil permeability, pits can be lined with an impermeable material to contain the drilling fluids. If water is encountered while digging the reserve pit, a closed mud system, consisting of steel tanks, may be required. For oil base mud, closed systems are mandatory, and the mud and cuttings must be recycled or disposed of in an approved manner.

Usually drilling activities begin within a week or two after the location and access road have been constructed. The conventional drilling rig and associated equipment are moved to the location and erected. Moving a drilling rig may require moving 10 to 25 truckloads of equipment over public highways and private roads. The derrick, when erected, is approximately 160 feet high. Drilling rigs for CBNG wells are much smaller, require fewer loads and are less structurally imposing.

Water for drilling is hauled to rig storage tanks or transported by surface pipeline. Water sources are usually wells or commercial water sources. Occasionally, water supply wells are drilled on or close to the site. The operator must obtain a permit from the Wyoming State Engineer for the use of surface or subsurface water for drilling and any applicable BLM surface use permits. When drilling commences, and as long as it progresses, water is continually transported to the rig location. Approximately 5,000 barrels or 210,000 gallons of water are required to drill an oil or gas well to the depth of 9,000 feet. More water is required if circulation is lost or permeable zones are encountered that cannot withstand the pressure of the drilling fluid.

Issuance of Rights-of-Way

Rights-of-way are required for all facilities, tank batteries, pipelines, powerlines, and access roads that occupy federally owned land outside the lease or unit boundary. When a third party (someone other than the operator) constructs a facility or installation on and/or off the lease, a right-of-way is also required. The right-of-way is issued by the BLM as detailed in the appendix entitled: Procedures for Processing APDs in the section of that appendix called Procedures for Handling Split Estate Requests for Access on Federal Surface.

DRILLING OPERATIONS

Rotary Drilling

Initially, drilling proceeds rapidly because of the less competent nature of shallow formations. Drilling is accomplished by rotating the drill string and putting variable weights on the bit located at the bottom of the string. While drilling, the derrick and associated hoisting equipment bear a majority of the drill string's weight. The combination of rotary motion and weight on the bit causes rock to be gouged away at the bottom of the hole. The rotary motion is created by a square or hexagonal rod, called a kelly, which fits through a square or hexagonal hole in a large turntable, called a rotary table. The rotary table sits on the drilling rig floor and as the bit advances, the kelly slides down through it. When the kelly has gone as deep as it can, it is raised, and a new piece of drill pipe about 30 feet in length is attached in its place. The drill pipe is then lowered, the kelly is reattached, and drilling recommences. When the bit becomes dull, it is necessary to "trip" the drill string and replace the bit. This is a time-consuming process of withdrawing 90-foot sections of the drill pipe until the bit is out of the hole. This process requires a large part of the total drilling time and may cause other hole problems. New bits constructed with modern metals and manufactured polycrystalline diamonds along with down hole mud motors have revolutionized drilling operations whereby thousands of feet of hole can be drilled with one bit run. In the RMPPA, it is not uncommon to record bit runs of 7,000 feet with one bit. The mud motor is a turbine driven by high-pressure mud and is placed at the top of the bit to enable more rotational power to be transmitted to the bit and thus increase penetration rates.

Drilling mud is circulated through the drill pipe to the bottom of the hole, through the bit, up the annulus of the well, across a screen that separates the rock chips, and into holding tanks from which finer sediments settle from the mud before it is pumped back into the well. The mud is maintained at a required weight and viscosity to cool the bit, reduce the drag of the drill pipe on the sides of the hole, seal off any porous zones, contain formation fluids to prevent a blowout, and bring the rock chips to the surface for disposal. Various additives are used in maintaining the mud at the appropriate viscosity and weight. Most of the mud consists of bentonite, a naturally occurring mineral that is mined in Wyoming. Some of the additives are caustic, toxic, or acidic, but these hazardous additives are used in small amounts during the drilling operations and later contained within the reserve pit.

Within the RMPPA, drilling is usually accomplished with water or light mud to depths within about 1,000 feet of the prospective formation. Water and natural clays recovered during the drilling operation or light drilling mud, allow fast drilling rates and the attendant reduction in mud chemicals. Once the bit reaches the target depth, the mud system is gradually made more sophisticated by addition of bentonite, chemicals, and natural weight materials to reduce water loss to the potential producing zones and to control the subsurface pressure. In almost all cases, the subsurface pressure is higher than an equivalent water column, and it is necessary to increase the mud weights to control the pressure and prevent a blowout or uncontrolled flow of formation fluids. Many wells are drilled in an underbalanced condition whereby the mud pressure is slightly less than the formation pressure, which increases penetration rate and reduces the time on the well or in the formations of interest. This reduces the potential of damaging the formation, with the attendant loss of flow capacity and recovery. The wells are always overbalanced for safety requirements when a bit trip is made, the well is logged, or the casing is installed.

Drilling operations are continuous, 24 hours a day, 7 days a week. The crews usually work three 8-hour shifts or two 12-hour shifts a day. Pickup trucks or cars are used for workers' transportation to and from the site. On remote isolated sites, a camp may be established to house the crews, which will reduce the travel requirements. Other operations, such as cementing, running casing and rig maintenance, will require road travel, sometimes with heavy equipment.

Upon completion of the drilling, a determination is made regarding the productive potential of the well. If oil or gas is not discovered in commercial quantities, the well is considered dry. The operator is then required to follow BLM procedures to properly plug the dry hole. The drill site and access road are then rehabilitated in accordance with the stipulations attached to the APD and the plugging approval. If the well is a producer, drilling rig operations continue until the production casing is cemented into the well prior to removing the drilling equipment from the location.

Logging

Geophysical logs are obtained by running various instruments into the hole on a wire cable. Logs are usually run at a depth point where casing will be installed. A log is not usually run before surface casing is set, but in most instances a log recording natural gamma radiation is run through the surface casing to determine the geology of that section. The logs can determine water resistivity, hydrocarbon saturations, natural gamma radiations, porosity of the rock by density, nuclear receptivity and sonic measurements, permeability, pressure, temperature, hole geometry and subsurface track. Logs are used to evaluate whether the well is dry or has the potential for a satisfactory completion. Logs also delineate the various geologic horizons; hydrocarbon zones; fresh, usable, and unusable water; and sands, shales, limestones, coals, and other minerals. The hydrocarbon intervals are usually randomly situated in each well, and logs are required to specify these intervals so that they can be perforated and stimulated during the completion program. Normally in the RMPPA, logs recording resistivity and a combined porosity log of density and nuclear receptivity are run in the well. The dual porosity logs are a direct indicator of gas because the measured values can be compared to provide contrasting porosities.

Casing

Various types of casing are placed in the drilled hole to enhance completion operations and safety. Casing is a string of steel pipe composed of approximately 40-foot lengths of pipe that are threaded together. Casing is cemented into the well to protect against migration of fluids within the hole and to isolate the productive zones so they can be completed and produced without interference from other zones containing hydrocarbons or water. Hole deviation, depth, bore hole environment, placement of

centralizers (if any), and a myriad of other factors affect the integrity of the casing and cement job and must be considered in the original design

Surface casing that is properly set and cemented also protects surface aquifers from contamination by drilling and production operations. Surface casing should be set to a depth greater than the deepest fresh water aquifer that could be reasonably developed. Usable water may exist at great depths but these aquifers are not normally considered to be important water sources. Surface casing is designed to be large enough to allow subsequent strings of smaller casing to be set as the well is drilled deeper. Cement is placed in the annulus of the surface casing from casing shoe to ground level. The surface casing is the first string on which blowout prevention (BOP) equipment is installed. The BOP allows the well to be shut in at any time that conditions warrant, protecting against unanticipated formation pressures and allowing safe control of the well. Blowout prevention equipment is tested and inspected regularly by both the rig personnel and the inspection and enforcement branch of BLM. Minimum standards and enforcement provisions are part of Onshore Order No. 2. Well-trained rig personnel are a necessity for proper blowout prevention.

Generally, only the bottom few thousand feet of intermediate or production casing is cemented, which often leaves several thousand feet of open hole behind some casing strings. In the RMPPA, the annulus is filled with sufficient cement to provide adequate protection from inter-zonal migration of unsuitable water and hydrocarbons. Production casing or production liner is designed to provide isolation of oil and gas formations and provide a high-pressure conduit to the hydrocarbon zones that allows stimulation of these intervals to improve the productivity.

During completion operations, the production casing or liner is perforated into zones containing the oil or gas. In the RMPPA, the low permeability character of the productive formations requires these zones to be "fraced" or stimulated by treated fresh water and large quantities of sand, which improves the productivity to an economic rate. Generally two and up to five stimulation treatments can be accomplished in each well. Normally, approximately 50 percent of the stimulation fluid is produced within a couple of days and the rest over an extended period at low rates. Radioactive tracers show the fracs stay within the zone, which is important to maximize the fracs productivity because a frac length is the primary factor in successfully stimulating a productive interval. After completion operations are finished, wellhead equipment, consisting of various valves and pressure regulators, is installed to control the oil or gas flow to the production facilities and allow safely shutting in the well under any conditions.

Oil and Gas Exploratory Units

Surface use in an oil or gas field may be affected by unitization of the leaseholds. In areas of federal and mixed mineral ownership, an exploratory unit can be formed before a wildcat exploratory well is drilled. The boundary of the unit is based on geologic data and attempts to consolidate the interests in an entire structure or geologic play. The developers of the unit enter into an agreement to develop and operate as a single entity, without regard to separate lease ownerships. Costs and benefits are allocated according to agreed-upon terms. Development in a unitized field can proceed more efficiently than in a field composed of individual leases because competition between lease operators and drainage considerations is not a primary concern. Unitization also can reduce surface use requirements because all wells are operated as though under a single lease, and operations can be planned for more efficiency. Duplication of field processing facilities is eliminated, and consolidation of facilities into more efficient systems is probable. Unitization can also involve wider spacing than usual or spacing based on reservoir factor rather than a set rule. This could result in fewer wells and higher recovery efficiency. WOGCC allows wells to be placed in units at any location as long as they are placed within 1,120 feet of the unit boundary. Through planning, access roads are usually shorter and better organized, facilities are usually consolidated, and well efficiency is maximized to a degree not seen in individual lease operations.

Within the RMPPA are 71, non-CBNG, producing oil/gas units totaling 397,213 acres. Most of the units are located in the Greater Green River Basin, with two in the Denver Basin and three in the Hanna and Laramie basins. Almost all of these units are the product of mature agreements with a few new exploratory units located in the more prospective areas of the RMPPA. Currently four coalbed natural gas units have been authorized, and four more are in the process of authorization, totaling 140,336 acres. Most of the CBNG units are located in the Atlantic Rim area on the eastern side of the Greater Green River Basin. Seven secondary recovery units exist in the RMPPA, primarily for the water flood recovery of oil. Two of these units are in a tertiary recovery phase using CO_2 in an alternating water/gas injection program. There are two active gas storage agreements are in the RMPPA.

Field Development

New field development is analyzed in an environmental assessment or Environmental Impact Statement (EIS) after the sufficient confirmation wells are drilled. The operator generally can estimate the extent of drilling and disturbance required to extract and produce the oil and gas at that time. Many fields go through several development stages. A field can be considered fully developed and produce for many years, when it is determined that a well can be drilled to a deeper pay zone or a new interval is discovered to be economically attractive. In this situation, there is generally little new disturbance because the old well bores or the old well pads are used for the new completions. A new stage of field development, such as infill drilling, can lead to increases in roads and facilities. All new construction, reconstruction, or alterations of existing facilities, including roads, flow lines, pipelines, tank batteries, or other production facilities must be approved by the BLM and may require a new environmental document. Throughout field development, partial restoration and rehabilitation is required to reduce the surface impacts to the minimum required to produce the resource.

The most important factor in further development of an oil or gas field is the economics of production. When an oil or gas discovery is made, a well spacing pattern can be established before development drilling begins. This is dependent upon the current statewide or area wide spacing. Well spacing is regulated by WOGCC, and factors considered in the establishment of a spacing pattern include data from the discovery well that translate into recovery efficiency. These data include porosity, permeability, pressure, composition of reservoir and fluids, depth of formations, well production rates, and the economic effect of the proposed spacing on recovery. These data are relatively sparse in the initial phase of development, and extended production permits refinement of these values. Because these data are so tentative, WOGCC tends to define large spacing until the data are more conclusive. The statewide spacing for oil production is 40 acres. Spacing for oil wells usually varies from 40 to 320 acres per well but can be as little as 2½ acres. Spacing for gas wells is generally from 160 to 640 acres per well but may be as small as 10 acres if reservoir recovery efficiency dictates that spacing. Spacing requirements can pose problems in selecting an environmentally sound location or in the cumulative overall impacts. Reservoir characteristics determine the most efficient spacing to achieve maximum recovery. If an operator determines that a different spacing is necessary to achieve maximum recovery, the state (with input from BLM) may grant exceptions to the spacing requirements.

Production

Gas, oil, and water are being produced in the RMPPA by means of natural flow (plunger lifts) and artificial lift (gas and electric pumping units and submersible pumps).

Gas Production

A typical gas well facility consists of methanol injection equipment (to keep production and surface lines from freezing), separator (which separates gas, oil and water), dehydrator (uses glycol or calcium chloride to extract entrained water in the gas), and an orifice meter. An intermitter is sometimes used to either shut-in the well to build up pressure or to blow the well down if it is being loaded with fluid. If the gas well is producing some oil or condensate, oil tanks are used to store the oil or condensate until it is sold via truck or pipeline. Pipeline quality gas at the wellhead requires a minimum of processing equipment. As the quality of gas decreases with the increased presence of water, solids, or liquid hydrocarbons, the amount of processing equipment increases. Water or liquid hydrocarbons in the gas are removed before the gas is sold, usually in the separation equipment near the wellhead. If liquid hydrocarbons are present, storage facilities (tank batteries) are required to store the liquids until they accumulate in sufficient quantities to be hauled out by large trucks. Gas dehydration equipment may also be present to remove water entrained in the gas to a water content defined by pipeline specifications. In the RMPPA, gas production has averaged 614,309 thousand cubic feet per day (MCFPD) for the last 4 years (starting in 2000), and this is up considerably from the production rate of 77,843 MCFPD recorded in 1978. These data are compiled from WOGCC files. Gas production curves are included in the Reasonable Foreseeable Development scenario for oil and gas that was developed for this RMPPA.

Gas that occurs with oil is separated by venting it at the tank battery or it may be collected into feeder lines leading to compressors that boost the pressure to the transportation system. If enough casinghead gas is separated to make it economical for marketing, a plant can be constructed to process the gas, or a pipeline can be constructed to carry the product to an existing plant. If the volume of casinghead gas is insufficient to warrant treatment in a gas plant, it is usually used as fuel for pump engines in the field or as heating fuel for the heater-treaters. Gas is flared or vented into the atmosphere if it exceeds the fuel requirements on the lease but is not in commercial quantities. Wyoming law prohibits the flaring or venting of natural gas. Exceptions allowed by the WOGCC are: 1) during testing of a new well, or 2) when the amount of gas produced with the oil is so small that pipeline construction is not practical. Otherwise, if a well produces both oil and gas, provisions for conserving the gas must be made before oil production can continue. BLM Notice to Lessee 4A (NTL4A) requires that all gas that is not used on the lease, vented, or flared without prior authorization either by the BLM or the WOGCC/BLM or avoidably lost; is subject to royalty obligations. In the RMPPA, standard APD COAs allow only 30 days of testing or 50 million cubic feet (MMCF) of vented or flared gas, whichever occurs first. If it is found that gas is produced beyond this point, a determination may be made that the gas was avoidably lost and subject to royalty obligations. Very little casing head gas is produced in the RMPPA, primarily because of the mature age of the fields that may produce this gas.

Oil Production

In the RMPPA, oil is generally produced using artificial lift methods (pump units). The oil production equipment: heater-treater, tank battery, and holding facility for production water are either placed on a portion of the location (on cut rather than fill) and located a safe distance from the wellhead or placed as a centralized facility that services a number of wells with pipeline connection. The heater-treater and tanks are surrounded by earthen dikes to contain accidental spills. Either all the facilities or only the produced water pit (if present) will be fenced. Production facility colors are required to be from the standard color chart and are specified in the APD COAs.

Production from several wells on one lease can be carried by pipeline to a central tank battery. Use of a central tank battery can depend on whether the oil is from the same formation, the same lease ownership, or multiple lease ownerships and formations if a commingling agreement is approved. Generally, because of the nature of the oil, adequate separation of oil and water is only obtained through applications of heat.

The fluid stream arrives at a separator point where the flash gas is taken off and, in most cases, this flash gas is used for lease operations. The remainder of the flash gas is either compressed and sold or flared. Flash gas is defined as solution gas liberated from the oil through a reduction in pressure. Water and oil are also being separated at this point by gravity segregation. The oil is sent to storage tanks, and the water is sent to a disposal or injection facility. Two main methods of oil measurement in the RMPPA are used—lease automatic custody transfer units and tank gauging. Measurement is required by 43 CFR 3162.7-2 and Onshore Order No. 4 to ensure proper and full payment of federal royalty.

Oil wells can be completed as flowing (those wells with sufficient underground pressure to raise the oil to the surface), or, if the pressure is inadequate, they are completed with the installation of subsurface pumps. The subsurface pumps are usually mechanically powered by a pumping unit. Pumping units come in a variety of sizes, the larger ones reaching a height of 30 to 40 feet. The units are powered by internal combustion engines or electric motors. Fuel for the engines may be casinghead gas or propane. In cases where large volumes of water are produced with the oil, electric submersible pumps can be installed. These pumps may produce up to 6,000 barrels of fluid per day at an oil cut of ½ of 1 percent oil. In the RMPPA, oil production has averaged 14,504 barrels of oil per day (BOPD) for the last 4 years (starting in 2000). This is down considerably from a production rate of 21,915 BOPD recorded in 1978. These data are compiled from WOGCC files. Currently, a large portion of the oil is condensate produced with natural gas. Oil production curves are included in the Reasonable Foreseeable Development scenario for oil and gas that was developed for this RMPPA.

CBNG Production

CBNG production combines high water production rates of some oil fields with low-pressure operations of some gas fields. Because of the reservoir characteristics of coal, high water production rates are initially required to dewater the reservoir and allow gas to be liberated from cleat surfaces within the coal. In a coal reservoir, gas is primarily trapped on the face of the coal within the cleat system via molecular attraction. Pressure must be reduced to liberate the gas molecules from the coal face. The production history shows that water production rates begin high, with little or no gas. The water rate then drops at a constant rate, with increasing gas rates until a maximum gas rate is achieved relative to the original gas saturation and reservoir pressures. The gas rate then declines to the economic limit. This process is the exact opposite of that associated with most oil and gas production, which starts at high hydrocarbon rates and low water rates and advances to low hydrocarbon rates and high water rates. The reservoir depths of CBNG production are generally shallow (less than 5,000 feet) compared with most oil and gas production in the RMPPA. The depth limit is based on coal permeability, which is highly sensitive to overburden weight. A CBNG operation usually consists of a high-capacity submersible or progressive cavity pump, with water produced out of the tubing, and low-pressure gas produced out of the casing. Centralized facilities collect the gas for compression to pipeline pressures and the water for disposal. Electric power is usually used to power the well pumps and is connected to the well via a subsurface cable laid with the water and gas lines. The producing well pad is very small, with only the well head and an insulating house to cover the well head. The centralized production facilities contain well header buildings where the individual well gas is measured and that house collection tanks, injections wells, and pumps for disposal of the water and multistage compressors to bring the very low pressure gas to sales line pressure. Sometimes the water can be disposed of in the local drainages if the Wyoming Department of Environmental Quality (WDEQ) and BLM approve of this type of disposal. Currently in the RMPPA, CBNG production is in its infancy, and little history is available regarding its economics and production rates. One project has produced about 1,965 MCFD and 6,711 BWPD over the year 2003 from 24 wells (82 MCFD/well) as compiled by WOGCC. Two other projects were abandoned after producing only water, and a third project is producing water with only small amounts of gas.

Water Production

Associated water produced with the oil, gas, or CBNG is disposed of by trucking the water to an authorized disposal pit, by placing the water in lined or unlined pits, by discharging the water into surface drainages, or through subsurface injection. Water disposal is controlled by the WDEQ for surface or near-surface disposal or by WOGCC for subsurface disposal and secondary recovery purposes. The quality of the water often dictates the appropriate disposal method, and WDEQ has primacy through the Environmental Protection Agency (EPA) to approve surface disposal of this water.

Produced water is also used in enhanced recovery projects. The RMPPA has been handling large volumes of water for a long period of time. This area was among the first in establishing secondary recovery operations in Wyoming, with several secondary recovery units created in the early 1960s, and one unit going back to 1937. Secondary recovery operations always require subsurface injection to enhance hydrocarbon recovery and, in most cases, use water. WOGCC files for the RMPPA show water production rates of 108,429 barrels of water per day (BWPD) in 1978, and this value reached a maximum of 338,925 BWPD in 1987. For the last 4 years, starting in 2000, water production rates averaged 246,473 BWPD. Essentially all of this water is injected into the subsurface with no apparent environmental harm.

Production Problems

Weather extremes pose problems for producers by causing roads to become impassable, equipment to malfunction, and flow lines, separators, and tanks to freeze up. Other problems producers face in the area are production of H_2S, CO_2, and paraffin; corrosion; electrolysis; and broken flow lines.

Secondary and Enhanced Oil Recovery

Gas reservoirs typically have no secondary recovery associated with the recovery of gas. This is because natural gas is produced by expansion resulting from the reduction of reservoir pressure. Typically a high reservoir recovery factor can be expected from this expansion process unless the reservoir is of such low permeability that economics becomes a factor in the recovery efficiency. Economics is a determining factor because of the expense of operating compression facilities to reduce the reservoir pressure to the minimum. In the RMPPA, most of the reservoirs are over pressured but have very low permeability. The overpressure allows more gas to be stored but the low permeability limits the recovery to a smaller portion of the area around each well. In the RMPPA, studies show that each well will recover the reserves within only an 80-acre pattern, requiring a doubling of the wells in most of the large gas fields to fully produce the resource.

In rare cases where the gas is very rich and contains a large quantity of entrained liquids, secondary recovery uses inert gases like nitrogen or dry natural gas to keep the reservoir pressure above the condensation point in order to produce the maximum amount of liquids. This secondary recovery process requires sweeping the reservoir with undersaturated gas to entrain and sweep out the rich gas. After this secondary process is accomplished, especially in dry natural gas secondary recovery operations, the reservoir is depressurized to recover the maximum amount of the remaining gas reserves.

Secondary recovery in coal reservoirs has been tested in the San Juan Basin and found to be technically feasible. It involves the molecular replacement of natural gas by carbon dioxide or nitrogen. This process has also been touted as a method of sequestering CO_2 to remove the greenhouse gas from the atmosphere. A large quantity of CO_2 is available immediately to the west of the RMPPA, and a CO_2 pipeline is located to the northwest of the projected CBNG development, so this process may potentially be used in the future if the economics are favorable.

An oil reservoir typically contains oil, gas, and water trapped within the rock matrix under pressure. Because of the pressure, much or all of the gas is dissolved in the oil. "Primary drive" is accomplished by the expansion of gas in solution, which forces oil out of the reservoir into the well and up to the surface. Oil flowing out of the reservoir drains energy from the formation and the primary drive diminishes. To keep oil flowing in the reservoir, pressure drawdown is required, and subsurface pumps may be used to lift oil to the surface. As reservoir pressures continue to drop, solution gas in the oil escapes, forming bubbles in the pore space. These bubbles further retard the flow of oil and increase the gas saturation and the flow of solution gas. This process accelerates as the pressure declines, and at some point, production rates become uneconomical, with as much as 80 percent of the original oil remaining in the reservoir. Currently, in the United States, primary oil recovery accounts for less than half of the current oil production. The remaining oil is produced via secondary and enhanced recovery techniques.

Two basic secondary recovery methods are in use: 1) water flooding and 2) displacement by gas. The preferred secondary recovery method is water flooding. This process involves injecting water into oil reservoirs to maintain or increase pressure. The process is usually most efficient when the pressure has not fallen to the point where the reservoir is highly saturated with gas. Reservoir heterogeneity in the form of fractures, directional permeability, and thin zones may limit the success of this process.

The process of injecting gas is a less popular secondary recovery technique. Historically, produced gas was considered a waste product and was flared (burned) at the point of production. Later, it was recognized that the energy could be conserved and the recovery of oil increased if the produced gas was re-injected into the reservoir. Increased production was achieved by: 1) maintaining reservoir pressure by injecting the gas into the existing gas cap, and 2) by injecting the gas directly into the oil-saturated zone, creating an immiscible gas drive that displaced the oil. To achieve miscibility, the reservoir must have reasonably high pressures and temperatures and contain high-gravity oil. Many gas injection projects use the water and gas (WAG) process, i.e., inject water and gas alternately to achieve better contact with the oil within the reservoir. Currently the high price and demand for natural gas has precluded this type of secondary recovery.

In the RMPPA, seven secondary recovery units have been or are currently being water flooded. Most of these include reservoirs within geologic structures located around the margins of the various basins such as Denver, Laramie, Carbon, and Greater Green River. Essentially all the floods are very mature, and economics become a major factor. Under the current high oil price environment, these floods should continue to produce but it is estimated that within the 20-year planning period many will reach their economic limit and be abandoned. A potential caveat is the potential for tertiary CO_2 injection as described below. The State of Wyoming is currently funding a major study related to the potential for CO_2 tertiary recovery, which may result in increased incentives via the tax system to implement this potential process and extend the life of these fields.

Gas injection is not currently being used as a secondary recovery technique within the RMPPA, although it was used in the past.

The term "enhanced recovery" is used to describe recovery processes other than the more traditional secondary recovery procedures. These enhanced recovery methods include thermal, chemical, and miscible (mixable) drives. Currently no enhanced recovery techniques are being implemented within the RMPPA, but it is unknown whether these techniques could be applicable in the future based on economics and new discoveries.

Some reservoirs contain large quantities of heavy oil that cannot be produced using normal or secondary methods. These may be stimulated by thermal drive processes in which heat is introduced from the surface or developed in place in the subsurface reservoir. In the surface introduction process, hot water or

steam is injected. Raising the temperature of heavy oil reduces the viscosity and makes the oil more mobile. Thermal recovery techniques are not likely to be tried in the RMPPA because the oils present here are not heavy oils. In the in-situ process, both heavy and light oils can be processed. Spontaneous or induced ignition within the reservoir is induced by injected air to develop a fire front that burns the hydrocarbons. Evaporation of the lighter ends immediately ahead of the fire front and later condensation is the primary recovery mechanism. The remaining hydrocarbons are consumed by the fire and are generally not considered of any value. These techniques are very expensive and must have large reserves and thick pay zones to be economical. It is unlikely they will be used within the RMPPA in the immediate future unless new discoveries are made.

Several chemical drive techniques are currently in use, including: 1) polymer flooding, 2) caustic flooding, and 3) surfactant-polymer injection. These methods attempt to change reservoir conditions to allow recovery of additional oil. Caustic and surfactant-polymer flooding have not been economical in the past, and unless a breakthrough in technology is achieved, they will probably not be considered during the planning period. Polymer flooding is an economically viable process but is used mainly in viscous reservoirs with high permeability. Currently no such reservoirs exist in the RMPPA but future discoveries could be made.

Carbon dioxide appears to have the best potential for enhanced and tertiary recovery methods. CO_2 is miscible with oil at relatively low pressures and temperatures, and can be used with oil with a wide range of characteristics. CO_2 miscibility reduces the oil viscosity and allows much more efficient displacement by water. Usually CO_2 is injected via the WAG process in alternating slugs of CO_2 and water. Not only does CO_2 create miscible flow but it also can displace oil by gravity segregation between the CO_2, gas, and oil. This process may allow sequestration of large volumes of the CO_2 greenhouse gas in the many applicable reservoirs in the RMPPA and recover the last possible oil reserves. Sequestration of CO_2 is advocated as a method to remove the gas from the earth's atmosphere by storing the gas for geologic time. Other structures within the RMPPA that do not contain oil could also be applicable for sequestration. Two tertiary recovery projects are active within the RMPPA at this time and both use CO_2. Both projects have been successful, and if prices remain high, they should recover a large volume of oil in the future. It is doubtful whether these projects will last the full 20 years unless CO_2 sequestration becomes economical via tax credit implementation.

Gas Storage

Pipeline-quality gas can be stored in good quality reservoirs with excellent sealing parameters. This gas is pumped into the reservoir during nonpeak, usually lower priced time periods, and then pumped out into the transmission lines at times of peak demand and good prices. The differential in price pays the governmental storage fees for the use of the reservoir and the injection/compression costs required to store and retrieve the gas. It also serves as a buffer for cold periods when demand is high and levels out the summer slack period of production. There are two active gas storage reservoirs within the RMPPA.

Plugging and Abandonment of Wells

The purpose of plugging and abandoning a well is to prevent fluid migration between zones, to protect minerals from damage, and to restore the surface area. Each well has to be handled individually due to a combination of factors, including geology, subsurface well design, and specific rehabilitation concerns. Therefore, only minimum requirements can be established, and these must be modified for individual wells.

The first step in the plugging process is the filing of the Notice of Intent to Abandon. This notice will be reviewed by both the SMA and RMPPA petroleum engineer. The notice must be filed and approved prior

to plugging a past producing well. Verbal plugging instructions can be given for plugging current drilling operations but a notice must be filed after the work is completed. If usable fresh water was encountered while the well was being drilled, the SMA may be allowed, if interested, to assume future responsibility for the well and the operator will be reimbursed for the attendant costs. This assumption of responsibility becomes effective after the deeper zones are plugged back to the usable water zone. Usually the operator is more than satisfied to remove the surface reclamation liability and will not charge for the remaining well equipment.

The operator's plan for securing the hole is reviewed. The minimum requirements as stated in Onshore Order No. 2, are as follows: In open hole situations, cement plugs must extend at least 50 feet above and below zones that have fluid with the potential to migrate, zones of lost circulation (this type of zone may require an alternate method to isolate it), and zones of potentially valuable minerals. Thick zones may be isolated using cement plugs across the top and bottom of the zone. In the absence of productive zones and minerals, long sections of open hole may be plugged with cement plugs placed every 3,000 feet. In cased holes, cement plugs must be placed opposite perforations and extending 50 feet above and below except where limited by plug back depth. The length of the plug is 100 feet plus 10 percent per 1,000 feet, i.e., at 10,000 feet, the plug will be 200 feet long.

Cement plugs could be replaced with a cement retainer, if the retainer is set 50 feet above the open perforations and the perforations are squeezed with cement. A bridge plug may also be used to isolate a producing zone and must be capped, if placed through tubing, with a minimum of 50 feet of cement. If the cap is placed using a dump bailer, a minimum of 35 feet of cement is required. A dump bailer is an apparatus run on wire line to convey the cement to the bottom of the hole. In the event that the casing has been cut and recovered, a plug is placed 50 feet within the casing stub, and the 100 feet plus 10 percent per 1,000 feet rule is used for the space above the cutoff point. In all cases, a plug is set at the bottom of the surface casing that has a volume of cement using the 100 feet plus 10 percent per 1,000 feet rule. This may require perforating the casing and circulating or squeezing cement behind the production casing if that casing is not removed. Annular space at the surface will be plugged with 50 feet of cement using small-diameter tubing or by perforating and circulating cement.

If the integrity of a plug is questionable or the position is extremely vital, it can be tested with pressure or by tagging the plug with the tubing or drill string. Tagging the plug involves running pipe into the hole until the plug is encountered and placing a specified amount of weight on the plug to verify its placement and competency. The surface plug within the casing must be a minimum of 50 feet. The interval between plugs must be filled with mud that will balance the subsurface pressures, and if this balance point is unknown, a minimum of 9 pounds per gallon is specified. After the casing has been cut off below the ground level, any void at the top of the casing must be filled with cement. If a metal plate is welded over the top of the casing, a weep hole is placed in the plate. A permanent abandonment marker is required on all wells unless otherwise requested by the SMA. This marker pipe is usually at least 4 inches in diameter, 10 feet long, 4 feet above the ground, and embedded in cement. The pipe must be capped with the well identity and location permanently inscribed.

The SMA is responsible for establishing and approving methods for surface rehabilitation and determining when this rehabilitation has been satisfactorily accomplished. With satisfactorily rehabilitation, a Subsequent Report of Abandonment is approved, and the well bond released. As of November 3, 2003, 2,958 wells had been plugged and abandoned in the RMPPA. Over the last 3 years, approximately 20 wells per year have been plugged and abandoned in the RMPPA.

APPENDIX 21—CLARIFICATION OF OHV DESIGNATIONS AND TRAVEL MANAGEMENT IN THE BLM LAND USE PLANNING PROCESS

In conformance with the Bureau of Land Management (BLM) Washington Office IM No. 2004-005 (October 1, 2003), the Rawlins Resource Management Plan Planning Area (RMPPA) will be divided into areas that are open, limited, or closed to off-highway vehicle (OHV) travel. Those areas that are designated limited may have seasonal restrictions or travel limitations to either existing or designated roads and vehicle routes, or any combination of these.

Road and Vehicle Route Designation Process for Limited to Designated OHV Areas

During the travel management planning period, the following will occur:

- Interim management guidelines for identification of the road and vehicle route network, including signing and maintenance, will be defined.
- Additional data needs and collection strategy will be outlined.
- A clear planning sequence, *including public collaboration*, criteria, and constraints for subsequent road and vehicle route selection and identification will be established with a schedule not to exceed 5 years.
- Collaboration on designation of roads and vehicle routes will occur, consistent with the goals, objectives, and other considerations described in the Resource Management Plan (RMP), according to the above planning sequence.
- A Travel Management Implementation Plan will be written.
- Installation of signs and barriers where needed, and reclamation according to the plan will occur.
- Desirable roads may be reopened after repairs, recovery, or adequate mitigation has occurred.

Until the designation process is completed, travel in limited to designated areas (LDA) will remain limited to existing roads and vehicle routes. Some portions of LDAs may receive other designations during the planning process outlined above. Travel on parcels of public land not having legal public access will remain limited to existing roads and vehicle routes.

The LDAs will be divided into geographic sub-areas in which specific roads and vehicle routes will be designated open to OHV travel. Geographic sub-areas and their order of consideration will be determined based on criteria such as current OHV use, areas with sensitive resources, and areas with special designations (i.e., Areas of Critical Environmental Concern [ACEC], wildlife habitat management areas and Special Recreation Management Areas [SRMA]). Roads and vehicle routes that are designated open may have further restrictions placed on their use.

During the planning process, teams made up of BLM, cooperating agencies, and members of the public will be used to ensure resource concerns and OHV user needs are properly addressed. Maps will be available to the teams that include all known roads to aid input for additional roads and vehicle routes to be considered for designation as open to OHV use. In addition to the sub-areas in general, these groups will address roads and vehicle routes in specific areas that have ongoing resource problems.

Criteria for road closures include the following:

- OHV use is causing, or will cause, considerable adverse effects.
- A road or vehicle route poses a threat to public safety.
- Road and vehicle route density is adversely affecting resources.
- Closure is necessary for desired future conditions for access.
- Closure is necessary for visual resource protection.
- Closure is necessary for sensitive habitat management.

BLM recognizes that designated OHV recreation sites play a vital role in satisfying a portion of the recreation experience for OHV enthusiasts. These areas include motocross tracks, novice riding areas, and dune riding areas. The proposed Rawlins OHV area and the OHV open area at the Dune Ponds Cooperative Management Area address these needs. These sites would be managed to reduce the possibilities for inappropriate activities on adjacent public and private lands. Management of these sites will include education, public outreach, and signing.

Table A21-1 shows the preliminary schedule for completion of the Travel Management Plan.

Table A21-1. Preliminary Schedule for Travel Management Plan for RMPPA LDAs

	Jan–March	April–June	July–Sept	Oct–Dec
Year 1	Create Basic Maps	Schedule and Draft Implementation Plan	Collaborate on Sub-Area A	Do Mapping and Purchasing for A
Year 2	Collaborate on Sub-Area B	Do Mapping and Purchasing for B	Implement Sub-Area A	Collaborate on Sub-Area C
Year 3	Do Mapping and Purchasing for C	Implement Sub-Area B	Implement Sub-Area C	Collaborate on Sub-Area D
Year 4	Collaborate on Sub-Area E	Do Mapping and Purchasing for D/E	Implement Sub-Area D/E	Complete Implementation
Year 5	Complete Documentation	Start Monitoring		

APPENDIX 22—ACEC DESIGNATION PROCESS

Areas of Critical Environmental Concern (ACEC) are areas of BLM-administered lands where special management attention is needed to protect their important and relevant values. "Special management attention" refers to management prescriptions developed during preparation of a Resource Management Plan (RMP) or amendment expressly to protect the important and relevant values on an area from the potential effects of actions permitted by the RMP, including proposed actions deemed to be in conformance with the terms, conditions, and decisions of the RMP (BLM Manual 1613). These are management measures that would not be necessary or prescribed if the critical and important features were not present.

To be designated as an ACEC, the area must meet the criteria of relevance and importance (as defined in BLM Manual 1613). Areas meeting the relevance criterion possess significant historic, cultural, or scenic values; fish or wildlife resources, including threatened and endangered species; or natural hazards. To meet the importance criterion, the resource must have substantial significance and value. This generally requires qualities of more than local significance and special worth, consequence, meaning, distinctiveness, or cause for

There were four existing ACECS within the Resource Management Plan Planning Area (RMPPA): Como Bluff ACEC, Sand Hills ACEC, Jep Canyon ACEC, and Shamrock Hills ACEC. Public comment received during scoping suggested that a number of areas be considered for designation as ACECs, and some areas were proposed as potential ACECs by BLM staff. Thus, other areas within the RMPPA that were identified as potential ACECs include the Red Rim-Daley Area, Upper Muddy Creek Watershed/Grizzly Area, High Savery Dam, Stratton Sagebrush Steppe Research Area, Chain Lakes Areas, Laramie Peak Area, Pennock Mountain wildlife habitat management area (WHMA), Wick-Beumee WHMA, Laramie Plains Lakes Area, blowout penstemon area, white-tailed prairie dog areas, historic trails, mountain plover concentration areas, the Bates Hole/Chalk Mountain cushion plant community, and the Powder Rim juniper woodland.

BLM was required to determine if existing ACECs and areas proposed for ACEC designation meet the relevance and importance criteria prior to inclusion in the RMP process. BLM used the proposal evaluation form presented in Table A22-1 to make this evaluation; the evaluation forms for all existing and proposed ACECs are presented in BLM (2004a). Areas that did not meet the relevance and importance criteria were dropped from further consideration for ACEC designation. Areas that met the relevance and importance criteria are discussed in Chapter 3 and management of these areas is presented in Chapter 2, Section 2.3.11 and Table 2-1.

Table A22-1. ACEC Proposal Evaluation Form—Rawlins Field Office

RMP Process

ACEC Proposal Evaluation Form Area Considered	
General Location	
General Description	
Acreage	
Values Considered	

Identification Criteria
To be considered as a potential ACEC and analyzed in RMP alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2.
Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
A significant historic, cultural, or scenic value (including but not limited to rare or sensitive archeological resources and religious or cultural resources important to Native Americans).		
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive, or threatened species; or habitat essential for maintaining species diversity).		
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).		
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs). A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process.		

Importance
The value, resource, system, process, or hazard described above must have substantial significance and values to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:

ACEC Proposal Evaluation Form		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities, which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.		
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.		
Has been recognized as warranting protection to satisfy national priority concerns or to carry out the mandates of FLPMA.		
Has qualities that warrant highlighting to satisfy public or management concerns about safety and public welfare.		
Poses a significant threat to human life and safety or to property.		

APPENDIX 23—MOU BETWEEN BLM AND WWDC CONCERNING HIGH SAVERY DAM AND RESERVOIR PROJECT

BLM MOU No. WY-030-03-05-073

To define and clarify the management roles and responsibilities of the BLM and WWDC for certain public lands near to or adjacent to the High Savery Dam and Reservoir Project.

BACKGROUND: The State of Wyoming through the Water Development Commission (WWDC) received a Section 404 permit from the U.S. Army Corps of Engineers on December 20, 2000, to construct the Little Snake Supplemental Water Supply Project, as the High Savery Dam and Reservoir alternative, hereafter referred to as the High Savery Dam and Reservoir Project. The proposed dam is located on Savery Creek in southern Carbon County, Wyoming. Savery Creek is a tributary to the Little Snake River, which flows into the Yampa River in Colorado. The dam's primary purpose is to provide approximately 12,000 acre-feet of supplemental irrigation water for hay production along Savery Creek and the Little Snake River, primarily during July, August, and September. As a condition of the Section 404 permit, the WWDC is to create a total of 32 acres of wetlands as mitigation for wetlands inundated or filled by the project. Approximately 17.51 acres of wetlands will be created on public land managed by the BLM. The WWDC is also to construct 17 in-stream erosion control structures as part of the Section 404 requirements. These structures are located in close proximity to the created wetlands and will help control stream entrenchment and lateral movement. The WWDC received right-of-way grant WYW-151862 on April 2, 2001, allowing the WWDC to create the wetlands and to construct the erosion control structures. The wetlands and structures are to be maintained for the life of the project, which is projected to be 100 years.

PURPOSE: The purpose of this Memorandum of Understanding (MOU) is to define and clarify the management roles and responsibilities of the BLM and the WWDC for public lands described as:

- T. 15 N., R. 88 W., 6th P.M., Carbon County, Wyoming
- Section 2: That portion of lots 14 and 15 west of the centerline of Carbon County Road 401;
- Section 10: NW¼NE¼, NE¼NW¼;
- Section 11: That portion of lots 2 and 5 west of the centerline of Carbon County Road 401, NE¼NW¼;
- Section 14: That portion of lots 4, 5, 6 west of the centerline of Carbon County Road 401, that portion of the SE¼NE¼ west of the centerline of Carbon County Road 401;
- Section 16: Lots 1, 2;
- Section 17: Lots 4, 5, 6, 7, 8, 9, NW¼SE¼;
- Section 18: Lot 19;
- Section 19: Lots 5, 12, 13, and 16.

See map A23-1.

AUTHORITY: This MOU is made and entered into by and between the BLM and the WWDC in accordance with the following authorities:

Title II of the Federal Lands Policy and Management Act of October 21, 1976 (90 Stat. 2747, 43 USC 1712); Legislation for the High Savery Dam and Reservoir Project, Ch. 2, 2001, Wyo. Sess. Laws.

AREAS OF COOPERATION:

Responsibilities of the BLM: The BLM will have overall management responsibility for the public lands addressed in this MOU. All management decisions will be coordinated with the WWDC.

Responsibilities of the WWDC: The WWDC will be responsible for obtaining all the required rights-of-way to construct the project on public lands and will be responsible for the operation and maintenance of the wetlands and erosion control structures in T. 15 N., R. 88 W., 6th P.M., Carbon County, Wyoming, section 2: that portion of lots 14, 15 west of the centerline of Carbon County Road 401; section 10: NW¼NE¼, NE¼NW¼; section 11: that portion of lots 2 and 5 west of the centerline of Carbon County Road 401, NE¼NW¼; section 14: that portion of lots 4, 5, 6 west of the centerline of Carbon County Road 401, that portion of the SE¼NE¼ west of the centerline of Carbon County Road 401; section 16: Lots 1, 2; section 17: Lots 4, 5, 6, 7, 8, 9, NW¼SE¼; and section 18: Lot 19; Section 19: Lots 5, 12, 13, 16. The BLM will coordinate and cooperate with the WWDC on other resource management activities that will occur on the described public lands. The main areas of resource management concern are discussed below:

Livestock Grazing Management: The WWDC controls the state lands to which the Mexican Meadows allotment grazing permit (#493041) is attached. WWDC has constructed a new fence splitting the Mexican Meadows allotment into two pastures. The south pasture will remain as the Mexican Meadows allotment, with AUMs adjusted to the border of the new fence. A ten-year grazing permit would be reissued with annual grazing authorized by cattle for the same season of use as the previous permit. The north pasture, which contains Savery Creek and the newly created wetlands, will be combined with the lands removed from Stratton's Sandstone Ranches, Savery Creek allotment into a new allotment called High Savery. It would also contain the dam, reservoir pool area, and other facilities. Public lands and AUMs in this allotment would not be assigned in an active grazing permit. Grazing within the High Savery allotment would be on an occasional basis to meet vegetative management and objectives, rather than for livestock production. If grazing occurs, a grazing lease would be agreed upon by the WWDC and a livestock operator, with use of public lands and AUMs adhering to the WWDC lease. Grazing use would be issued on a temporary, non-renewable basis.

Mineral Resource Management: The BLM will manage the locatable, leaseable, and salable mineral resources on the subject public lands. The WWDC and BLM will coordinate very closely to manage the mineral resources to minimize conflicts between mineral development and the High Savery Dam and Reservoir Project. The BLM will get concurrence with WWDC prior to selling any salable minerals. The BLM will stipulate any leaseable mineral lease with a no surface occupancy term and condition.

Recreation Management: The BLM and WWDC will manage recreation cooperatively on the subject public lands. For public safety and protection of structures and facilities, access will be restricted to foot access. Accommodations to allow foot access and prevent unwanted vehicular traffic on public lands would be the responsibility of both the WWDC and BLM.

Water, Wetland, and Riparian Management: The WWDC will be responsible for water, wetland, and riparian management on the subject public lands as required by the Section 404 permit for the High Savery Dam and Reservoir Project. Management of these resources will be coordinated with the BLM.

ADMINISTRATION

Term of MOU: This MOU shall become effective upon signature by all participants and shall be in effect until terminated. Any party may withdraw from the MOU by giving 60 days written notice to the

other party. Parties agree to meet prior to termination of this MOU. The parties also agree to meet periodically to validate the continued need and also to discuss if any changes to the MOU are necessary.

In carrying out the activities under this MOU, the parties agree to comply with all applicable State and Federal laws.

The terms and conditions contained in right-of-way grants WYW-151861 and WYW-151862 granted April 2, 2001, to the WWDC from the BLM will take precedent over this MOU.

That nothing herein shall be construed in any way as limiting the legal authority of the BLM in connection with the proper administration and protection of all properties administered by BLM in accordance with Federal laws and regulations.

Payment: No payment shall be made to either party by the other party as a result of this MOU. Any commitments or exchange of value shall be accomplished by separate instrument.

That nothing in this MOU shall be construed as obligating the BLM or WWDC to expend funds in any contract or other obligations for future payments or services in excess of those available or authorized for expenditure.

Amendments: Either party may request changes in this MOU. Any changes, modifications, revisions, or amendments to this MOU, which are mutually agreed upon by and between the parties to this MOU shall be incorporated by written instrument, executed, and signed by all parties to this MOU.

Entirety of MOU: This MOU, consisting of five pages, represents the entire and integrated MOU between the parties and supersedes all prior negotiations, representations and agreements, whether written or oral (with the exception of right-of-way grants WYW-151861 and WYW-151862).

Prior Approval: This MOU shall not be binding upon either party unless this MOU has been reduced to writing before performance begins as described under the terms of this MOU, and unless the Wyoming's Attorney General or his representative approves this MOU as to form.

Severability: Should any portion of this MOU be judicially determined to be illegal or unenforceable, the remainder of the MOU shall continue in full force and effect, and either party may renegotiate the terms affected by the severance.

Sovereign Immunity: The U.S. Department of Interior, Bureau of Land Management, the State of Wyoming, and the Wyoming Water Development Commission do not waive their sovereign immunity by entering into this MOU, and each fully retains all immunities and defenses provided by law with respect to any action based on or occurring as a result of this MOU.

Third Party Beneficiary Rights: The parties do not intend to create in any other individual or entities the status of third party beneficiary and this MOU shall not be construed so as to create such status. The rights, duties, and obligations contained in this MOU shall operate only between the parties to this MOU, and shall inure solely to the benefits of the parties to this MOU. The provisions of this MOU are intended only to assist the parties in performing their obligations under this MOU. The parties to this MOU intend and expressly agree that only parties signatory to this MOU shall have any legal or equitable right to seek to enforce this MOU, to seek any remedy arising out of a party's performance or failure to perform any term or condition of this MOU, or to bring action for the breach of this MOU.

The Federal Government's liability shall be governed by the provisions of the Federal Tort Claims Act (28 USC 267-80). The State of Wyoming's liability shall be government by Wyoming State Stat. 1-39-101 *et seq.* and all other state law.

No member of, or delegation to, Congress or Resident Commissioner shall be admitted to any share or part of this MOU, or to any benefit that may arise there from; but this provision shall not be construed to extend to this MOU if made with a corporation for its general benefit.

Dispute Resolution: The BLM and WWDC agree to comply with this MOU and to take the following actions if the two parties are in conflict over the administration of this MOU.

- Contact, when appropriate, or meet with parties to evaluate the validity of any complaint.
- Conduct an MOU-in-hand review of the activity site within 10 days, or an agreed to time, after receiving the complaint to determine if violations had occurred.
- Evaluate the activity or project site in regards to this MOU to determine the need for any changes, amendments, modifications, or revisions to this MOU.
- Modify, amend, or revise this MOU to assure that any additional mitigation measures, deemed necessary through the MOU are implemented.
- Throughout the implementation and administration of the MOU, the participants shall comply with all Federal Statutes relating to nondiscrimination. These include but are not limited to:
- Title VI of the Civil Rights Act of 1964 (P.L. 88-352), which prohibits discrimination on the basis of race, color, handicap or national origin; and, (b) Title IX of the Education Amendments of 1972, as amended (20 U .S. C. 1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex.

APPROVALS

In witness whereof, the parties to this MOU through their duly authorized representatives have executed this MOU on the days and dates set out below and certify that they have read, understood and agreed to the terms and conditions of this MOU as set forth herein.

U.S. Department of the Interior

Bureau of Land Management

Rawlins Field Office

_____ _____

Kurt J. Kotter, Field Manager Date

Wyoming Water Development Commission

_____ _____

Lawrence M. Besson, Director Date

APPROVAL AS TO FORM:

_____ _____

S. Jane Caton Date

Senor Assistant Attorney General

APPENDIX 24—MITIGATION GUIDELINES FOR SPECIAL STATUS PLANTS

Mitigation options to avoid or reduce impacts to rare plants may be limited because of specific habitat requirements or lack of necessary biological information to make such an assessment. Most of the common techniques, such as compensation mitigation or habitat restoration, have proven largely unsuccessful, although seed banking is commonly performed to attempt off-site propagation. Mitigation plans for areas where impacts to these species cannot be avoided are designed to provide special management actions that minimize the overall impact to the species. However, because of the difficulties of providing successful mitigation options, impacts to special status plants are considered less than significant only if no net loss of population size or habitat quality results. "No net loss" is intended to mean that BLM must "ensure that [actions authorized, funded, or carried out by BLM] . . . affecting the habitat of special status species are carried out in a manner that is consistent with the objectives for managing those species. BLM shall not carry out any actions that would cause any irreversible or irretrievable commitment of resources or reduce the future management option for the species involved" (BLM Manual 6840).

APPENDIX 25—VISUAL RESOURCE MANAGEMENT

Visual resource management is the system by which the Bureau of Land Management (BLM) classifies and manages scenic values and visual quality of public lands. The system is based on research that has produced ways of assessing the natural attributes of the landscape in objective terms. After inventory and evaluation, lands are given visual ratings (management classes) that determine the amount of modification allowed to the basic elements of the landscape.

INVENTORY AND EVALUATION OF VISUAL RESOURCE MANAGEMENT

The visual resource inventory process (BLM Handbook 8410-1) provides BLM managers with a means for determining visual values. The inventory consists of a scenic quality evaluation, sensitivity level analysis, and a delineation of distance zones. Based on these three factors, BLM-administered lands are placed into one of four visual resource inventory classes. These inventory classes represent the relative value of the visual resource.

VISUAL RESOURCE MANAGEMENT CLASSES

Visual resource management classes represent the degree of acceptable visual change within a characteristic landscape. A class is based on the physical and sociological characteristics of any given homogeneous area and serves as a management objective. The four classes are described below:

Class I

- Preserves the existing character of the landscape
- Provides for natural ecological changes only
- Does not preclude very limited management activity
- Allows only an extremely low level of change to the characteristic landscape that must not attract attention
- Includes primitive areas, wilderness study areas, some natural areas, some wild and scenic rivers, and other similar areas where landscape modification activities should be restricted.

Class II

- Retains the existing character of the landscape
- Allows management activities to be seen, but they should not attract the attention of the casual observer
- Requires changes to repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape
- Requires modifications to a proposal if the proposed change cannot be adequately mitigated to retain the character of the landscape.

Class III

- Partially retains the existing character of the landscape
- Requires that areas where changes in the basic elements (form, line, color, or texture) are caused by a management activity should not dominate the view of the casual observer
- Requires that changes remain subordinate to the visual strength of the existing character.

Class IV

- Allows management activities to dominate the view and be the major focus of viewer attention
- Allows areas where changes subordinate the original composition and character; however, these changes should reflect what could be a natural occurrence within the characteristic landscape.

APPENDIX 26—ROAD MANAGEMENT AND CLOSURES IN SENSITIVE HABITAT AREAS

The following identifies criteria for limiting access and roads within the following areas that will be considered for spatial and temporal closure or limited access. This list is not all inclusive, and other criteria may be added on a case-by-case basis when identified.

CRITERIA FOR CLOSURE

- Critical habitats for Threatened and Endangered (T&E) species
- Other high-value habitats associated with T&E, proposed, or candidate species
- Crucial big game winter habitat and range
- Bureau of Land Management (BLM) Wyoming State Sensitive Species
- Raptor concentration areas
- Parturition habitats
- Greater sage-grouse/sharp-tailed grouse winter habitat and leks
- Riparian areas

METHODS OF CLOSURE

Spatial (Area) Closures, Limits to Surface Disturbing Activities

- Restriction of road development
- Roads in crucial winter range
- Roads in parturition areas
- Roads in other sensitive wildlife habitats
- Signing

Temporal (Seasonal) Closures, Limits to Disruptive Activities During Critical Times

- Crucial winter range, generally from November 15–April 30
- Seismic activities
- Remote monitoring of facilities
- Maintenance actions
- Signing

Permanent Closures

- Barriers to access
- Reclamation of roads
- Signing

APPENDIX 27—PROCEDURES FOR PROCESSING APPLICATIONS FOR PERMIT TO DRILL

Upon receipt, an application (Application for Permit to Drill [APD] or Notice of Staking [NOS]) is posted for a 30-day public review. The APD is checked for completeness by the fluids minerals staff and entered into various databases. Bonding and lease adequacy, including any inclusions in other administrative categories such as units or communization agreements, is determined. Spacing and location requirements are within the jurisdiction of the Wyoming Oil and Gas Conservation Commission (WOGCC), and these requirements are checked as described in the memorandum of understanding (MOU) between the Bureau of Land Management (BLM) and WOGCC. Sometimes these requirements result in hearings before the WOGCC that delay the APD approval process. Any discrepancies in adjudication, wildlife, cultural resources, and any perceived deficiency in the surface use plan or drilling plan is communicated to the operator within 7 days of the receipt of the APD and the operator has 45 days to correct these deficiencies or the APD is returned.

In conjunction with posting an APD, specialist requests are sent to each resource specialist to review the project's site-specific details to determine conformance with the Resource Management Plan (RMP) and any other environmental plan (Environmental Impact Statement [EIS] or Environmental Assessment [EA]) that encompasses the project location. These specialists are paleontology/geology, cultural, range (grazing), soils/water (hydrology), realty, transportation, and wildlife. Each specialist is intimately familiar with specific resource attributes within the various plans. In almost all cases, each site-specific location is visited by the specialists to identify the precise character at that site. In some cases, it is necessary to obtain more specialized input from outside agencies, such as U.S. Fish and Wildlife Service and State Historic Preservation Office (SHPO), and these consultations are included in the appropriate specialist's comments. The individual specialist's expertise and judgment is communicated to the fluid minerals natural resource specialist (NRS) who compiles the information and generates an appropriate site-specific National Environmental Policy Act (NEPA) document. In this process, the NRS reviews the proposal in the context of existing environmental documents and the RMP to determine whether existing documentation is adequate. If existing documentation is adequate, the NRS prepares an Administrative Determination (AD). If existing documentation is insufficient or nonexistent, the NRS prepares NEPA documentation as needed, using the appropriate format (see BLM NEPA Handbook. H-1790-1).

The NRS also generates reasonable conditions of approval (COA), based on sound science and each specialist's requirement to protect or mitigate the various resources (see Wyoming Instruction Memorandum WY-90-346). The COAs are included in the approved application as a contractual requirement for that specific project. Because the COAs represent decisions of the authorized officer, they can be appealed if the operator considers the COAs too onerous to exercise the benefits of the lease. Under the Energy Policy and Conservation Act (EPCA), COAs are also be continuously evaluated to determine their effectiveness and necessity.

In specified seasonally restricted areas, an approved APD generally includes a seasonal COA because (1) the APD is valid for 1 year from date of issuance and BLM does not control the start-up date for project activity; and (2) field conditions during the crucial period cannot be predicted at the time of APD approval. The need for a COA must be documented in an appropriate site-specific NEPA document and must consider the reasonableness of the restriction.

PROCEDURES FOR HANDLING SPLIT ESTATE REQUESTS FOR ACCESS ON FEDERAL SURFACE

A right-of-way grant is required for access roads and well sites on federal surfaces overlying state or fee minerals. The procedure to acquire this right-of-way and other cooperative regulatory requirements is defined in an MOU between BLM and the State of Wyoming WOGCC, dated September 13, 1994, BLM MOU WY920-94-09-79. The MOU was entered into by and between BLM and the WOGCC in accordance with Federal Land Policy and Management Act (FLPMA). The other cooperative regulatory requirements are underground injection, units and communitization agreements, well spacing, and geophysical operations. Appendix 2–I-A-3 of the MOU states that the BLM agrees to: "Notify the Commission within ten working days after receipt of the APD by the appropriate BLM office of any critical environmental problems regarding surface operations (i.e., big game crucial winter range, known cultural resources, presence of threatened and endangered species, etc.). Prior to notifying the commission, critical environmental problems will be confirmed and justified through on-site inspections by the BLM to verify potential problems. The existence of big game crucial winter range will not be used as the sole reason for denying access to a location."

The right-of-way grant is administered by Lands and Realty and is essentially processed in same manner as an APD. Specialist requests are sent to each resource specialist to review the project's site-specific requirements to determine conformance with the RMP and any other environmental plan (EIS or EA) that encompasses the project location. After the resource specialists' requests are returned, the realty specialist compiles the information and generates an appropriate site-specific NEPA document. In this process, the realty specialist reviews the proposal in the context of existing environmental documents and the RMP to determine whether existing documentation is adequate. If existing documentation is adequate, the realty specialist prepares an AD. If existing documentation is insufficient or nonexistent, the realty specialist prepares NEPA documentation as needed, using the appropriate format (see BLM NEPA Handbook H-1790-1). The realty specialist generates stipulations and attaches these to the right-of-way grant. These grants are, in most cases, written for 30 years and may have processing cost reimbursement and rental fee requirements.

APPENDIX 28—PLANT COMMON AND SCIENTIFIC NAMES

This is a partial list of plants common and scientific names, provided to save space in document text, and is in no way intended to be a comprehensive list of species found within the Rawlins Field Office (RFO) area.

Table A28-1. Upland Plant Common and Scientific Names with Synonyms, following Dorn, 2001, *Vascular Plants of Wyoming*, 3rd ED

Common Name	Scientific Name (Dorn 2001)	Scientific Name Synonym(s)
Grass-like Plants		
threadleaf sedge	*Carex filafolia*	
elk sedge	*Carex geyeri*	
Baltic rush	*Juncus balticus*	
Grasses		
redtop bent	*Agrositis alba*	
meadow foxtail	*Alopecurus aequalis*	
threeawn	*Aristida spp.*	
sideoats grama	*Bouteloua curtipendula*	
blue grama	*Bouteloua gracilis*	
hairy grama	*Bouteloua hirsuta*	
smooth brome	*Bromus inermis*	
mountain brome	*Bromus marginatus*	
cheatgrass	*Brumus techtorum*	
buffalo grass	*Buchloe dactyloides*	
bluejoint reedgrass	*Calamagrostis canadensis*	
pine reedgrass	*Calamagrostis rubenscens*	
prairie sandreed	*Calomovilfa longifolia*	
oatgrass	*Danthonia spp.*	
tufted hairgrass	*Deschampsia cespitosa*	
inland saltgrass	*Disticalis stricta*	*Disticalis spicata*
Canada wildrye	*Elymus canadensis*	
basin wildrye	*Elymus cinereus*	
bottlebrush squirreltail	*Elymus elymoides*	*Sitanian hystrix*
blue wildrye	*Elymus glaucus*	
thickspike wheatgrass	*Elymus lanceolatus*	*Agropyron dasystachyum*
western wheatgrass	*Elymus smithii*	*Agropyron smithii - Pascopyrum smithii*
blue bunch wheatgrass	*Elymus spicatus*	*Agropyron spicatum - Pseudoroegneria spicata*
slender wheatgrass	*Elymus trachycoulus*	*Agropyron trachycaulum*
Idaho fescue	*Festuca idahoensis*	
foxtail barely	*Hordium jubatum*	
prairie junegrass	*Koeleria macrantha*	*Koeleria cristata*
king spike fescue	*Leucapoa kingii*	
onion grass	*Melica bulbosa*	
slimstem muhly	*Muhlenbergia filiculmis*	
Sandhill muhly	*Muhlenbergia pungens*	
Indian ricegrass	*Oryzopsis hymenoides*	
alpine timothy	*Phleum alpinum*	
timothy	*Phleum pratense*	
big bluegrass	*Poa ampla*	
mutton bluegrass	*Poa fendleriana*	*Poa longiligula*
Wheeler bluegrass	*Poa nervosa*	
Kentucky bluegrass	*Poa pratensis*	

Common Name	Scientific Name (Dorn 2001)	Scientific Name Synonym(s)
Sandberg bluegrass	*Poa secunda*	*Poa sandbergii*
alkali grass	*Puccinellia spp.*	
blowout grass	*Redfieldia flexuosa*	
little bluestem	*Schizachyrium scoparium*	
alkali cordgrass	*Spartina gracilis*	
alkali sacatoon	*Sporobolus airoides*	
sand dropseed	*Sporobolus cryptandrus*	
Columbian needlegrass	*Stipa columbiana*	
needle-and-thread	*Stipa comata*	
green needlegrass	*Stipa viridula*	
Forbs		
false dandilion	*Agoseris glouca*	
wild onion	*Alium testile*	
columbine	*Aquilegia spp.*	
Hooker sandwart	*Arenaria hookeri*	
arnica	*Arnica spp.*	
aster	*Aster spp.*	
milkvetch	*Astragalus spp.*	
balsom root	*Balsamorhiza sagittata*	
segolily	*Calochartus nuttallii*	
harebell	*Campanula parryi*	
Indian paintbrush	*Casteligia spp.*	
chickweed	*Cerastium brachypodum*	
larkspur	*Delphinium spp.*	
field horsetail	*Equisitum arvense*	
buckwheat	*Eriogenum spp.*	
elkweed	*Frasera speciosa*	
bedstraw	*Galium spp.*	
halogeton	*Halogeton glomeratus*	
mountain iris	*Iris missuriensis*	
pepperweed	*Lepidium densiflorium*	
licorice-root	*Ligusticum tenuifolium*	
biscuitroot	*Lomatium grayi*	
lupine	*Lupinus spp.*	
bluebell	*Mertensia spp.*	
Oregon grape	*Mohonia repens*	
pricklypear cactus	*Opuntia polyacantha*	
loco weed	*Oxytrophis spp.*	
penstemon	*Penstemon spp.*	
phlox	*Phlox spp.*	
slimflower scurfpea	*Psoralea tenuiflora*	
groundsel	*Senicio spp.*	
checker mallow	*Sidalcea candida*	
checker mallow	*Sidalcea neomexicana*	
globe mallow	*Sphaeralcea coccinea*	
seablight	*Suada nigra*	
mountain pea	*Thermospsis spp.*	
clover	*Trifolium spp.*	
stinging nettle	*Urtica dioica*	
vetch	*Vicia spp.*	
violet	*Viola spp.*	
woody aster	*Xylarhira glabriuscula*	
yucca	*Yucca glouca*	
Shrubs		
service berry	*Amelanchier alnifolia*	
silver sagebrush	*Artemisia cana*	
sand sagebrush	*Artemisia filafolia*	
fringe sage wort	*Artemisia frigida*	

Common Name	Scientific Name (Dorn 2001)	Scientific Name Synonym(s)
alkali sagebrush	*Artemisia longifloia*	
black sagebrush	*Artemisia nova*	
birdsfoot sagebrush	*Artemisia pedatifida*	
bud sagebrush	*Artemisia spinescense*	
Wyoming big sagebrush	*Artemisia tridentata var. wyomingensis*	
Basin big sagebrush	*Artemisia tridentata var.tridentata*	
mountain big sagebrush	*Artemisia tridentata var.vaseyana*	
shadescale	*Atriplex conferifolia*	
Gardener saltbush	*Atriplex gardeneri*	
true mountain mahogany	*Cercocarpus montanus*	
green rabbitbrush	*Chysothamnus viscidiflorus*	
redosier dogwood	*Cornus sericea*	*Cornus stolenifera*
rubber rabbit brush	*Ericameria nauseosa*	*Chysothamnus nauseosus*
spinny hopsage	*Grayia spinosa*	
broom snakeweed	*Gutiarrizia sarothorea*	
common juniper	*Juniperous communis*	
winterfat	*Krascheninnikovia lanata*	*Ceratoides lanata - Eurosia lanata*
shruby cinquefoil	*Pentaphylloides floribunda*	*Potentilla fruticosa*
chokecherry	*Prunus virginiana*	
bitterbrush	*Pursha tredentata*	
golden current	*Ribes aureum*	
wax current	*Ribes cereum*	
mountain gooseberry	*Ribes inerme*	
sticky current	*Ribes viscosissimum*	
Woods rose	*Rosa woodsii*	
Bebb's willow	*Salix bebiana*	
Booth willow	*Salix boothii*	
yellow willow	*Salix eriocephala var.watsonii*	*Salix lutea*
coyote willow	*Salix exigua*	
Geyer willow	*Salix geyeriana*	
whiplash willow	*Salix lasiandra*	
planeleaf willow	*Salix plantifolia*	
Scouler's willow	*Salix scouleriana*	
greasewood	*Sarcobatus vermiculatus*	
russet buffalo berry	*Sheperdia argentea*	
buffaloberry	*Sheperdia canadensis*	
snow berry	*Syphoricarpos albus*	
horsebrush	*Tetradymia canescens*	
Trees		
subalpine fir	*Abies lasiocarpa*	
water birch	*Betula occidentalis*	
Utah juniper	*Juniperous osteosperma*	
Rocky Mountain juniper	*Juniperous scopulorum*	
Engleman spruce	*Picia englemannii*	
logdepole pine	*Pinus contorta*	
limber pine	*Pinus flexus*	
ponderosa pine	*Pinus ponderosa*	
narrow leaf cottonwood	*Populus angustifolia*	*Populus sargentii*
balsam poplar	*Populus balsamifera*	
plain cottonwood	*Populus deltoida*	
Fremont cottonwood	*Populus fremontii* *	
quaking aspen	*Populus tremuloides*	
Douglas fir	*Pseudotsuga menziesii*	

* *not included in Dorn 2001*

Table A28-2. Plant Species Typical of Wetlands and Wet Meadows in Wyoming

Species	Scientific Name
Forbs	
Horsetail	*Equisetum spp.*
Iris	*Iris missouriensis*
Grasses	
northern reedgrass	*Calamagrostis inexpansa*
tufted hairgrass	*Deschampsia cespitosa*
slender wheatgrass	*Elymus trachycaulus*
smooth brome	*Bromus inermis*
saltgrass	*Distichlis stricta*
orchard grass	*Dactylis glomerata*
meadow barley	*Hordeum brachyantherum*
Kentucky bluegrass	*Poa pratensis*
foxtail barley	*Hordeum jubatum*
Basin wildrye	*Elymus cinereus*
alkaligrass	*Puccinellia nuttalliana*
alkali sacaton	*Sporobolus airoides*
alkali cordgrass	*Spartina gracilis*
redtop	*Agrostis alba*
mat muhly	*Muhlenbergia richardsonis*
Grass-like	
cattail	*Typha sp.*
water sedge	*Carex aquatilis*
field sedge	*Carex praegracilis*
Ross' sedge	*Carex rossii*
needleleaf sedge	*Carex stenophylla*
beaked sedge	*Carex urtriculata*
alkali bulrush	*Bolboschoenus maritimus*
spike rush	*Eleocuris palustris*
tulerush	*Schoenoplectus tabernaemontani*
Baltic rush	*Juncus balticus*
Shrubs	
Wood's rose	*Rosa woodsii*
silver sagebrush	*Artemisia cana*
silver buffaloberry	*Shepherdia argentea*
shrubby cinquefoil	*Potentilla fruticosa*
golden currant	*Ribes aureum*
gooseberry	*Ribes lacustre*
water birch	*Betula occidentalis*
Douglas hawthorn	*Crataegus douglasii*
willow species	*Salix species*
Dogwood	*Cornus stolonifera*
cottonwood species	*Populus species*

This table does not represent a complete list of wetland plants in the RMPPA. The complete list of plant species that occur in wetlands is published by the Fish and Wildlife Service, U.S. Department of the Interior, and is used to evaluate whether the vegetation present meets the requirement of a jurisdictional wetland. The RMPPA is located in regions 9 and 4; the majority of the RMPPA is in region 9 (USFWS 1998).

BIBLIOGRAPHY

Dorn, R. D., 2001. Vascular plants of Wyoming, third ed. Mountain West Publishing, Cheyenne, Wyoming.

USFWS, 1988. National List of Plant Species that Occur in Wetlands: Northwest (Region 9), 1993 Supplement to Biological Report 88 (26.9).

APPENDIX 29—RANGE ALLOTMENT INFORMATION

Table A29-1. Range Allotment Information for the Rawlins RMPPA.

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
00301	PATHFINDER	9,335	1,920	6,503	2,701	20,459	1,506	CATTLE	1-May	31-Jan	ROTATION
00302	LITTLE CANYON CREEK	1,424	0	720		2,144	165	CATTLE	1-May	30-Oct	DEFERRED ROTATION
00303	CANYON CREEK	5,340	3,400	3,680		12,420	857	CATTLE/ HORSE	1-May	30-Nov	PERMIT LONG
00304	WAGON TONGUE	775	640	8		1,423	123	CATTLE	1-Jun	7-Jul	PERMIT LONG
00305	CAMP CREEK	3,217	1,440	4,040		8,697	706	CATTLE	1-Jun	30-Nov	PERMIT LONG
00306	KIRK RANCH	3,395	1,306	404		5,105	365	CATTLE	1-Nov	6-Mar	PERMIT LONG
00307	BATES HOLE	14,381	1,722	6,094		22,197	2,085	CATTLE	1-May	31-Oct	DEFERRED ROTATION
00309	MOSS AGATE	6,355	548	85		6,988	893	CATTLE/ SHEEP	1-Jun	10-Oct	PERMIT LONG
00310	ANTELOPE SPRINGS	2,977	0	40		3,017	578	SHEEP	1-Jun	30-Sep	PERMIT LONG
00311	BATES BENCHMARK	4,262	1,360	720		6,342	625	CATTLE/ SHEEP	1-Jun	10-Oct	PERMIT LONG
00312	7E RANCH	8,845	640	4,888		14,373	1,370	CATTLE/ SHEEP	1-Mar	28-Feb	YEARLONG PERMIT
00313	WEST LITTLE MEDICINE	6,922	640	40		7,602	994	CATTLE	1-May	31-Oct	PERMIT LONG
00314	MINE	4,050	130	5,705		9,885	525	CATTLE	1-May	31-Oct	PERMIT LONG
00315	INDIAN SPRINGS	2,851	0	2,071		4,922	433	CATTLE	1-Jun	15-Oct	DEFERRED ROTATION
00316	DRY CREEK RIM	25,750	4,200	14,082		44,032	4,346	CATTLE	15-May	31-Oct	PERMIT LONG
00317	UPPER DRY CREEK	5,712	580	1,470		7,762	1,044	CATTLE	1-Jun	5-Oct	PERMIT LONG
00318	SHIRLEY RIDGE	7,693	640	680		9,013	981	CATTLE/ HORSE	11-May	30-Sep	PERMIT LONG
00319	EAST LITTLE MEDICINE	3,141	520	9,710		13,371	3,675	CATTLE/ SHEEP	1-May	31-Oct	PERMIT LONG
00320	LEO	9,121	640	2,993	2,327	15,081	3,320	CATTLE	15-Apr	14-Nov	DEFERRED ROTATION
00321	DRY CREEK	9,861	640	4,520		15,021	1,213	CATTLE	1-Mar	28-Feb	DEFERRED ROTATION

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
00322	SPRING CREEK	10,387	640	2,904		13,931	1,998	CATTLE	1-Mar	31-Oct	REST ROTATION
00323	BLACK CANYON	11,067	1,082	3,020	3,288	18,457	2,106	CATTLE	26-Apr	25-Nov	DEFERRED ROTATION
00324	PALMER-NELSON	4,241	680	2,830		7,751	898	CATTLE	1-Jun	31-Oct	PERMIT LONG
00325	CADY	185	0	148		333	20	CATTLE	1-May	31-Oct	PERMIT LONG
00326	BEAVER CREEK	2,385	358	3,464		6,207	826	CATTLE	15-Jul	10-Oct	DEFERRED ROTATION
00327	SCHOOL SECTION	816	609	95		1,520	222	CATTLE	1-Jul	31-Dec	PERMIT LONG
00328	SULLIVAN	108,640	14,738	69,275		192,653	20,618	CATTLE	1-May	15-Oct	DEFERRED ROTATION
00329	LOST CREEK	2,895	43	0		2,938	450	CATTLE	1-May	1-Sep	DEFERRED ROTATION
00330	HOUSE GULCH	2,395	481	1,446		4,322	631	CATTLE	1-Mar	15-Oct	DEFERRED ROTATION
00331	UPPER LOST CR.	589	0	163		752	120	CATTLE	1-May	2-Oct	PERMIT LONG
00332	THORNTON PLACE	2,852	0	8		2,860	374	CATTLE	1-Jun	30-Sep	PERMIT LONG
00333	SOUTH BENNETT (NO.)	3,466	0	0	1,059	4,525	772	CATTLE/ SHEEP	1-Jun	30-Nov	PERMIT LONG
00334	CORRAL CREEK	5,710	1,120	1,000		7,830	1,181	CATTLE/ SHEEP	1-May	30-Nov	PERMIT LONG
00335	SHIRLEY MOUNTAIN	18,308	1,920	12,256		32,484	3,655	CATTLE/ SHEEP	1-May	31-Oct	PERMIT LONG
00336	MUD SPRINGS	1,193	95	1,520		2,808	927	CATTLE	11-May	30-Sep	PERMIT LONG
00337	PETRIFIED FOREST	8,311	600	3,942		12,853	1,423	CATTLE	1-May	31-Oct	PERMIT LONG
00338	ANDA	9,184	624	4,363		14,171	1,691	CATTLE	1-Jun	15-Oct	DEFERRED ROTATION
00339	GRASSHOPPER	40	0	0		40	10	CATTLE	1-May	31-Oct	PERMIT LONG
00340	HORSE SPRINGS	5,228	2,919	3,377		11,524	1056	CATTLE	1-May	31-Oct	DEFERRED ROTATION
00349	PEDRO MOUNTAINS	3,405	0	0		3,405	0	CATTLE			NO PERMIT
00350	LOST CREEK RANCH	166	0	885		1,051	18	CATTLE	1-Mar	28-Feb	DEFERRED ROTATION
00401	AIRPORT	840	640	0		1,480	249	CATTLE	15-May	15-Nov	DEFERRED ROTATION
00402	ANTELOPE	1,394	80	1,480		2,954	319	CATTLE	1-Jun	5-Oct	PERMIT LONG
00403	BAGGS SUB-UNIT	3,985	0	4,426		8,411	264	CATTLE	1-Apr	15-Jun	ROTATION

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
00404	ANTELOPE DRAW	3,986	0	0		3,986	1,391	CATTLE	1-Apr	30-Sep	DEFERRED ROTATION
00405	BEAVER DAMS	3,565	1,342	480		5,387	682	CATTLE/ SHEEP	1-Jun	30-Sep	DEFERRED ROTATION
00406	BODEN	1,452	330	160		1,942	189	CATTLE	1-Jun	30-Sep	PERMIT LONG
00407	CENTENNIAL CR.	2,776	598	98		3,472	771	CATTLE	15-Jun	30-Sep	DEFERRED ROTATION
00408	CHEROKEE	63,765	3,663	1,539		68,967	7,562	CATTLE/ SHEEP	15-Apr	15-Dec	ROTATION
00409	COTTONWOOD DRAW	2,111	640	706		3,457	360	CATTLE	1-Jun	18-Sep	PERMIT LONG
00410	COYOTE DRAW	4,376	0	53		4,429	472	CATTLE	1-Jun	15-Sep	DEFERRED ROTATION
00411	CUSHING	5,653	84	0		5,737	1,178	CATTLE	10-May	23-Jun	PERMIT LONG
00412	DEEP GULCH	26,954	4,330	4,042	126	35,452	3,597	CATTLE/ SHEEP	15-May	27-Nov	DEFERRED ROTATION
00413	DIRTY MAN	228	0	560		788	20	CATTLE	25-Jun	4-Oct	DEFERRED ROTATION
00414	DISH	15,700	2,330	2,400		20,430	4,262	CATTLE	25-May	25-Oct	PERMIT LONG
00415	DOTY MOUNTAIN	59,504	1,600	22,904		84,008	6,976	CATTLE	1-Apr	1-Dec	DEFERRED ROTATION
00417	GRIZZLY	27,533	9,332	1,226		38,091	5,280	CATTLE/ SHEEP	1-Mar	30-Oct	ROTATION
00418	HARTT CREEK	3,067	920	3,957		7,944	681	CATTLE	1-Jun	30-Sep	DEFERRED ROTATION
00419	JACK CREEK	1,030	1811	5,818		8,659	420	CATTLE	1-Mar	28-Feb	DEFERRED ROTATION
00420	LITTLE JACK CREEK	2,244	975	1,009		4,228	307	CATTLE/ SHEEP	1-Jun	7-Sep	ROTATION
00421	MCCARTY CANYON	3,104	5,081	1,095		9,280	465	CATTLE	15-May	25-Sep	DEFERRED ROTATION
00422	METHODIST	4,591	1,095	867		6,553	1,476	CATTLE	15-Jun	20-Oct	SPLIT SEASON
00423	MIDDLEWOOD HILL	14,347	3,072	104		17,523	3,074	CATTLE	1-May	31-Oct	DEFERRED ROTATION
00425	MORGAN CREEK	4,060	1,715	4,639		10,414	1,187	CATTLE	30-May	1-Oct	DEFERRED ROTATION
00426	MORGAN RANCH	2,780	250	1,900		4,930	263	CATTLE/ SHEEP	30-May	8-Nov	DEFERRED ROTATION

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
00427	NORTH SPRING CREEK	227	0	1,449		1,676	25	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
00428	CHEROKEE CREEK	866	665	3,095		4,626	137	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
00429	RICH	5,875	0	175		6,050	1,158	CATTLE	1-May	30-Jun	PERMIT LONG
00430	SAGE CREEK	13,763	6,946	8,724		29,433	3,156	CATTLE	10-May	25-Sep	DEFERRED ROTATION
00431	SAVERY CREEK	2,821	1,035	6,332		10,188	436	CATTLE	10-May	15-Oct	DEFERRED ROTATION
00432	SNOW CREEK	5,249	0	0		5,249	1,278	CATTLE/ SHEEP	1-Jun	30-Sep	PERMIT LONG
00433	SULPHUR SPRINGS	12,832	800	9,120		22,752	2,096	CATTLE	1-May	4-Oct	DEFERRED ROTATION
00434	TWIN GROVES	200	965	6,645		7,810	40	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
00435	WILD COW	7,868	867	80		8,815	1,760	CATTLE	16-Jun	30-Nov	DEFERRED ROTATION
00436	WINDMILL	3,264	520	0		3,784	600	CATTLE	10-May	13-Jul	PERMIT LONG
00437	HILL ISO TR	140	0	0		140	30	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
00438	SPRING CR ISO TR	200	0	1,400		1,600	30	CATTLE	1-Oct	28-Feb	DORMANT SEASON
00440	BARTLETT ISO TR	425	0	0		425	71	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
00441	NORTH PASTURE	400	0	120		520	57	CATTLE	15-Sep	14-Nov	PERMIT LONG
00442	DAD	433	0	0		433	94	CATTLE	1-Jun	15-Jun	ROTATION
00443	EAST MUDDY	5,484	15	655		6,154	301	SHEEP	1-Mar	10-Apr	ROTATION
00444	TRUCK DRIVERS CREEK	170	0	0		170	30	CATTLE	15-May	14-Oct	PERMIT LONG
00446	ANTELOPE ISOLATED TR	120	0	0		120	23	CATTLE	1-May	31-Oct	PERMIT LONG
00448	J. O. PASTURES	418	0	718		1,136	61	CATTLE/ SHEEP	1-Sep	31-Dec	DEFERRED ROTATION
00449	SIERRA MADRE RANCH	40	0	0		40	5	CATTLE	1-Jun	31-Oct	PERMIT LONG
00450	STANDARD	11,626	640	1,010		13,276	3,530	CATTLE/ SHEEP	1-Mar	31-Oct	PERMIT LONG
00451	JIM BERGER	657	0	0		657	91	CATTLE	10-May	10-Aug	PERMIT LONG
00453	THOMAS RYAN	371	0	0		371	53	CATTLE	25-May	30-Sep	PERMIT LONG

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
00456	DEEP CREEK PASTURE	1,571	390	4,211		6,172	635	CATTLE/ SHEEP	1-May	31-Oct	DEFERRED ROTATION
00457	WEST WILD COW	3,502	333	0		3,835	437	CATTLE	16-Jun	30-Nov	DEFERRED ROTATION
00505	CHEROKEE TRAIL	11,176	0	0		11,176	1,459	CATTLE/ SHEEP	1-Mar	31-Dec	DEFERRED ROTATION
00514	LITTLE ROBBER	480	0	0		480	250	CATTLE	1-May	30-Sep	SPLIT SEASON
00605	DALEY RANCH	11,305	1,280	13,498		26,083	959	CATTLE	1-May	31-Oct	ROTATION
00606	DOOLITTLE	280	0	390		670	90	CATTLE/ SHEEP	1-May	31-Oct	DEFERRED ROTATION
00630	CANAL	160	0	1,600		1,760	42	CATTLE	1-May	15-Oct	PERMIT LONG
00687	SMILEY DRAW	1,345	0	2,195		3,540	226	CATTLE	1-Jun	10-Nov	DEFERRED ROTATION
00688	UPPER SAVERY CREEK	340	0	646		986	40	CATTLE	1-Jun	30-Sep	ROTATION
00689	WEST LOCO	120	40	760		920	30	CATTLE	1-Jun	31-Oct	PERMIT LONG
00690	COTTONWOOD CREEK	200	0	4,840		5,040	34	CATTLE	1-Apr	30-Nov	ROTATION
00699	MIDDLE CEDAR CREEK	184	640	0		824	39	CATTLE	1-May	31-Oct	PERMIT LONG
00701	BELL SPRINGS	4,506	0	4,388		8,894	346	CATTLE	1-Mar	31-Dec	ROTATION
00703	EAST CITY LIMITS	5,350	0	7,586		12,936	0	CATTLE			NO PERMIT
00704	EAST SINCLAIR	900	0	3,151		4,051	83	CATTLE	1-Mar	28-Feb	DEFERRED ROTATION
00705	RED DESERT ALLOTMENT	22,580	640	23,511		46,731	1,960	CATTLE	1-Mar	31-May	ROTATION
00706	G. L.	9,426	0	9,695		19,121	1,268	CATTLE	1-Mar	30-Nov	DEFERRED ROTATION
00707	HAYSTACK	36,339	1,920	41,284		79,543	4,209	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
00708	HAYSTACK RIVER PAST	840	640	0		1,480	113	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
00709	JAWBONE	11,560	0	11,568		23,128	1,326	CATTLE	16-May	31-Oct	ROTATION
00710	MONUMENT DRAW	15,417	0	0		15,417	1,834	CATTLE	15-Apr	31-Dec	ROTATION
00711	MONUMENT LAKE	57,483	1,850	60,104		119,437	6,327	CATTLE	1-Mar	28-Feb	ROTATION
00712	THAYER	286	0	2,000		2,286	29	CATTLE	1-Jan	15-Jun	DORMANT SEASON
00713	NORTH CRESTON-WEST	10,871	0	0		10,871	1,178	CATTLE	15-Mar	15-Jun	DEFERRED ROTATION

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
00714	LATHAM	19,580	640	19,693		39,913	1,782	CATTLE	1-Mar	28-Feb	DEFERRED ROTATION
00715	NORTH TIPTON	12,256	640	13,221		26,117	1,334	CATTLE	1-Dec	30-Apr	DORMANT SEASON
00716	NORTH WAMSUTTER	28,238	677	30,255		59,170	2,935	CATTLE	20-Apr	2-Oct	DEFERRED ROTATION
00717	RUBY KNOLLS	15,355	0	14,811		30,166	3,022	CATTLE	1-Jun	30-Sep	PERMIT LONG
00718	SANDSTONE	38,074	1,881	45,298		85,253	5,046	CATTLE	1-Mar	31-Oct	DEFERRED ROTATION
00719	SEPARATION FLATS	45,455	660	42,795		88,910	4,654	CATTLE	1-Mar	28-Feb	ROTATION
00723	SHAMROCK PASTURE	61	483	1,942		2,486	1	CATTLE	1-Mar	28-Feb	ROTATION
00726	RYAN ROCKS	635	0	0		635	47	HORSE	1-Mar	22-Oct	PERMIT LONG
00727	T. Z. RANCH	40	0	102		142	7	CATTLE	1-May	31-Oct	PERMIT LONG
00730	BEAR CREEK	77	0	422		499	15	CATTLE	15-Jun	15-Aug	PERMIT LONG
00731	WEATLAND ROAD	80	0	560		640	17	CATTLE	15-Jun	15-Aug	PERMIT LONG
00732	MIDDLE SYBILLE CREEK	37	0	104		141	8	CATTLE	15-Jun	15-Aug	PERMIT LONG
00733	SOUTH FORK CANYON CREEK	1,816	640	3,195		5,651	350	CATTLE	15-May	31-Oct	PERMIT LONG
00800	DIFFICULTY	8,000	0	12,200		20,200	1,636	CATTLE	1-May	31-Oct	PERMIT LONG
00801	LARSON KNOLLS	5,117	0	5,118		10,235	616	CATTLE	16-May	31-Oct	ROTATION
00802	TENNANT PLACE	130	0	320		450	18	CATTLE	1-Jun	15-Oct	DEFERRED ROTATION
00803	WEST ANSCHUTZ	8,248	2,040	14,559		24,847	1,428	CATTLE	1-May	31-Oct	DEFERRED ROTATION
00805	EAST SEMINOE	1,207	0	0	699	1,906	168	CATTLE	5-Jul	31-Oct	PERMIT LONG
00806	SCHNEIDER RIDGE	2,867	0	1,103		3,970	212	CATTLE	1-May	15-Oct	PERMIT LONG
00807	SOUTH LEO	16,295	1,049	24,195	2,497	44,036	2,279	CATTLE/ SHEEP	1-Mar	1-Oct	PERMIT LONG
00808	T. E. RANCH	1,608	246	4,919		6,773	536	CATTLE	11-May	1-Oct	PERMIT LONG
00809	MEDICINE BOW	794	620	7,671		9,085	181	CATTLE	20-Jun	15-Sep	PERMIT LONG
00811	ELLIS BLOCK	13,830	1,011	17,844		32,685	446	CATTLE	1-May	4-Dec	DEFERRED ROTATION
00812	FREEZEOUT	520	0	562		1,082	73	CATTLE	1-Jul	30-Nov	PERMIT LONG
00813	VANDIVER DITCH	1,297	0	1,085		2,382	265	CATTLE	1-May	31-Oct	DEFERRED ROTATION

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00814	T. B. FLATS D.M.	1,000	0	2,507		3,507	162	CATTLE/ HORSE	16-Apr	30-May	PERMIT LONG
00816	FT STEELE BREAKS	9,419	80	9,447		18,946	790	CATTLE/ SHEEP	1-Mar	28-Feb	DEFERRED ROTATION
00817	LITTLE MEDICINE	1472	640	11,861		13,973	329	CATTLE	10-May	9-Nov	DEFERRED ROTATION
00819	NORTH WALCOTT	31,768	1,360	36,897	655	70,680	2,348	CATTLE/ SHEEP	1-Mar	28-Feb	YEARLONG PERMIT
00820	QUEALEY BLOCK	23,681	560	26,954	3,067	54,262	3,848	CATTLE/ SHEEP	1-Mar	28-Feb	YEARLONG PERMIT
00821	SOUTH SEMINOE	1,900	0	3,044	390	5,334	558	CATTLE/ SHEEP	1-Mar	28-Feb	YEARLONG PERMIT
00822	DANA BLOCK NORTH	26,713	1,280	35,523	3,067	66,583	4,962	CATTLE/ SHEEP	1-Mar	10-Nov	PERMIT LONG
00824	NORTH AREA	12,605	640	22,859		36,104	1,295	CATTLE	1-Mar	30-Nov	DEFERRED ROTATION
00825	SLATE RIDGE	4,931	640	11,236		16,807	644	CATTLE	1-May	31-Oct	DEFERRED ROTATION
00826	ROBBERS ROOST	2,027	640	7,093		9,760	333	CATTLE	15-May	31-Oct	DEFERRED ROTATION
00827	PASS CREEK RIDGE	26,308	360	33,328		59,996	3,597	CATTLE	15-Apr	31-Oct	PERMIT LONG
00828	WILSON PASTURE	320	0	1,801		2,121	65	CATTLE	1-May	31-Oct	PERMIT LONG
00829	DANA MEADOWS SOUTH	13,864	1,920	21,683		37,467	2,336	CATTLE	1-May	10-Dec	DEFERRED ROTATION
00830	CHACE BLOCK	14,996	5,546	44,970		65,512	1,866	CATTLE	1-Apr	11-Jan	DEFERRED ROTATION
00831	COAD MOUNTAIN	7,012	0	19,295		26,307	621	CATTLE	25-May	27-Sep	DEFERRED ROTATION
00832	NORTH ANSCHUTZ	4,479	0	5,120		9,599	1,220	CATTLE	1-May	31-Oct	DEFERRED ROTATION
00833	T. B. NORTH AREA	530	0	1,177		1,707	76	CATTLE	1-May	31-Dec	ROTATION
00834	FOOTE CREEK PASTURE	6,466	1,280	13,115		20,861	1,292	CATTLE	1-May	31-Oct	DEFERRED ROTATION
00835	PETES GAP	2,560	0	3,200		5,760	348	CATTLE	1-Jul	30-Sep	DEFERRED ROTATION
00838	SOUTH WALCOTT	2,413	320	2,778		5,511	323	SHEEP	1-Mar	28-Feb	DEFERRED ROTATION
00839	LONE TREE ALLOTMENT	2,559	0	2,723		5,282	470	CATTLE	16-May	31-Oct	PERMIT LONG

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00840	SOIL BANK PASTURE	160	0	640		800	27	CATTLE	1-May	31-Oct	PERMIT LONG
00841	SCHROEDER	120	0	5,262		5,382	7	CATTLE	15-May	1-Nov	PERMIT LONG
00842	WOLFE	1,250	0	360		1,610	168	CATTLE	21-May	31-Oct	PERMIT LONG
00843	MEADS	640	0	3,360		4,000	120	CATTLE	1-May	31-Oct	PERMIT LONG
00844	PASS CREEK FLATS	3,238	640	3,667		7,545	293	CATTLE	1-May	31-Oct	PERMIT LONG
00845	T. A. RANCH	858	517	4,157	2,085	7,617	338	CATTLE	15-May	25-Jun	ROTATION
00846	COYOTE DITCH	80	640	2,240		2,960	12	CATTLE	1-May	31-Oct	PERMIT LONG
00847	HOME PASTURE	80	0	0		80	13	CATTLE	1-May	31-Oct	PERMIT LONG
00848	RATTLESNAKE	950	0	718		1,668	202	CATTLE	1-May	31-Oct	PERMIT LONG
00849	MIDLAND	661	0	0		661	165	CATTLE	1-Jun	31-Aug	PERMIT LONG
00850	HOME RANCH	7,152	3,360	17,802		28,314	585	BISON/ CATTLE	20-May	30-Sep	DEFERRED ROTATION
00851	WEST ELK MOUNTAIN	790	0	0		790	127	CATTLE	15-May	30-Sep	ROTATION
00852	UPPER ROBBERS ROOST	2,880	0	9,906		12,786	447	CATTLE	15-May	31-Oct	PERMIT LONG
00853	U. L. ALLOTMENT	640	640	2,560		3,840	120	CATTLE	15-May	31-Oct	DEFERRED ROTATION
00854	SOUTH ANSCHUTZ BLOCK	2,280	2,080	12,071		16,431	345	CATTLE	1-May	31-Oct	DEFERRED ROTATION
00855	ARLINGTON ALLOTMENT	841	0	1,199		2,040	142	CATTLE	1-Jul	29-Aug	DEFERRED ROTATION
00856	PINE RIDGE	880	640	3,989		5,509	207	CATTLE	1-Jun	30-Sep	PERMIT LONG
00857	DIAMOND DOME	2,331	1,743	9,076		13,150	518	CATTLE	16-May	30-Sep	PERMIT LONG
00858	THREE MILE TRACT	40	0	0		40	8	CATTLE	1-Apr	28-Feb	PERMIT LONG
00859	COALBANK MINE	1,120	640	2,698		4,458	294	CATTLE	1-May	30-Jun	DEFERRED ROTATION
00860	UPPER BEAR CREEK	652	1,280	2,724		4,656	66	CATTLE	1-May	31-Oct	PERMIT LONG
00861	CORPENING	2,503	320	3,861		6,684	327	CATTLE	18-Apr	31-May	ROTATION
00862	LAKE CREEK FLATS	3,770	0	3,609		7,379	329	CATTLE/ SHEEP	1-Mar	28-Feb	DEFERRED ROTATION
00863	NORTH LAKE CREEK	160	0	0		160	45	CATTLE	1-Jun	28-Aug	PERMIT LONG
00864	SIXMILE HILL	147	120	620		887	10	CATTLE	1-Mar	30-Dec	DEFERRED ROTATION
00865	LAKE CREEK	1,280	0	348		1,628	0	CATTLE			NO PERMIT

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00866	BUCK SPRINGS DRAW	1,440	320	640		2,400	188	CATTLE	15-May	15-Nov	DEFERRED ROTATION
00867	DUMP	1,280	0	850		2,130	192	CATTLE	25-May	30-Sep	PERMIT LONG
00868	V U	2,647	0	0		2,647	391	CATTLE	1-May	15-Oct	DEFERRED ROTATION
00869	CEDAR CR	120	0	0		120	10	CATTLE	1-Apr	30-Nov	PERMIT LONG
00870	EAST COAD MTN ALLOT	190	0	644		834	40	CATTLE	1-May	31-Aug	PERMIT LONG
00871	BASIN RANCH	760	2,320	13,720		16,800	127	CATTLE	20-Jun	15-Sep	DEFERRED ROTATION
00872	OVERLAND TRAIL	120	640	1,406		2,166	24	CATTLE	1-Jul	16-Sep	DEFERRED ROTATION
00873	DIXON BLOCK	637	0	647		1,284	144	CATTLE	1-Jul	30-Sep	PERMIT LONG
00875	COOPER HILL	840	0	0		840	121	CATTLE	20-Jun	15-Sep	PERMIT LONG
00876	SEVEN MILE	400	0	0		400	60	CATTLE/ HORSE	1-Jun	31-Aug	PERMIT LONG
00877	WILLS	298	0	617		915	54	CATTLE	1-May	20-Sep	PERMIT LONG
00878	COUNTY LINE	320	160	160		640	74	CATTLE	15-May	12-Sep	PERMIT LONG
00879	LONESOME FOX	100	0	720		820	18	CATTLE	1-Jul	31-Dec	PERMIT LONG
01009	CHEROKEE CREEK	953	0	793		1,746	122	CATTLE	1-Jul	6-Sep	PERMIT LONG
01021	BEAVER HILLS	960	0	3,872		4,832	183	CATTLE	1-Jun	15-Jul	DEFERRED ROTATION
01022	ROMIOS RANCH	2,120	0	440		2,560	265	CATTLE	15-Jun	31-Aug	PERMIT LONG
01030	HEATHER CREEK	2,047	44	62		2,153	162	CATTLE	15-Jun	15-Oct	DEFERRED ROTATION
01045	CHAD	1,672	640	1,850		4,162	295	CATTLE	1-May	31-Oct	DEFERRED ROTATION
01063	COYOTE HILL	137	0	1,109		1,246	41	CATTLE	1-Jun	15-Jul	PERMIT LONG
01101	AIRHEART PASTURE	520	640	701		1,861	96	CATTLE	16-Mar	15-Jul	ROTATION
01102	BIG GULCH	120	0	320		440	30	CATTLE/ SHEEP	3-Jun	1-Oct	DEFERRED ROTATION
01103	WEST BROWNS HILL	635	640	1,708		2,983	162	CATTLE	22-Jun	28-Aug	DEFERRED ROTATION
01104	CEDAR RIDGE	821	0	80		901	164	CATTLE	16-Apr	31-Oct	PERMIT LONG
01106	CUSHING	280	0	286		566	20	CATTLE	16-Jun	15-Sep	PERMIT LONG
01107	DOLAN	240	320	20		580	60	CATTLE	1-May	30-Nov	ROTATION

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01108	ETHERINGTON	80	0	0		80	32	CATTLE	10-Jun	30-Oct	PERMIT LONG
01109	FLY CREEK	529	0	0		529	100	CATTLE	1-May	30-Jun	DEFERRED ROTATION
01110	HELL CANYON	1,051	0	1,128		2,179	148	CATTLE	1-Jun	30-Sep	DEFERRED ROTATION
01111	HILL PASTURE	325	0	1,448		1,773	31	CATTLE	1-May	31-Oct	ROTATION
01112	LITTLE HORSE MTN	630	0	40		670	220	CATTLE	1-May	24-Jun	ROTATION
01113	LITTLE SANDSTONE	1,340	460	380		2,180	148	CATTLE/ SHEEP	1-Jun	12-Oct	ROTATION
01115	MCCARY	395	0	0		395	102	CATTLE	15-Jun	31-Oct	PERMIT LONG
01117	MEXICAN MEADOWS	320	2,880	80		3,280	69	CATTLE	1-May	15-Oct	DEFERRED ROTATION
01118	MORGAN-BOYER SUBUNIT	8,260	643	2,260		11,163	1,702	CATTLE/ SHEEP	15-May	30-Oct	ROTATION
01119	NORTH RASMUSSEN	882	0	0		882	248	CATTLE	1-Jun	30-Oct	DEFERRED ROTATION
01121	PIONEER DRAW	190	0	0		190	55	SHEEP	1-May	20-Jul	PERMIT LONG
01122	POLING ISO TRACT	135	0	605		740	20	CATTLE	10-May	31-Aug	PERMIT LONG
01123	RASMUSSEN SUBUNIT	4,751	2,503	12,157		19,411	792	CATTLE	15-Jun	30-Nov	DEFERRED ROTATION
01124	READER	205	0	0		205	30	CATTLE	1-May	31-May	PERMIT LONG
01125	READER BASIN PASTURE	2,276	2,078	5,221		9,575	466	CATTLE	1-May	15-Oct	ROTATION
01126	ROAD GULCH	975	0	0		975	213	CATTLE/ SHEEP	1-Mar	28-Feb	PERMIT LONG
01127	SHEEP MOUNTAIN	303	0	0		303	53	CATTLE	16-May	15-Sep	PERMIT LONG
01128	SHORT	995	0	70		1,065	167	CATTLE	1-May	30-Jun	ROTATION
01129	SOUTH BAGGS	280	0	0		280	30	CATTLE/ SHEEP	1-May	31-Oct	PERMIT LONG
01130	SOUTH PASTURE	497	0	3,383		3,880	89	CATTLE	1-Apr	30-Sep	ROTATION
01132	SPRING GULCH	471	0	0		471	110	CATTLE	1-May	29-Sep	DEFERRED ROTATION
01133	STANDARD	330	0	0		330	92	CATTLE	15-Jun	30-Sep	PERMIT LONG
01134	STATE LINE 40	40	0	0		40	4	CATTLE	1-May	31-May	PERMIT LONG
01135	CEDARS	160	0	0		160	12	CATTLE	1-May	31-Oct	ROTATION
01136	BATTLE MTN ISO TRACT	92	0	0		92	13	CATTLE	1-May	18-Jun	ROTATION

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01138	M. J. ANDERSON ISO #1	40	0	529		569	9	CATTLE	1-Jun	15-Oct	DEFERRED ROTATION
01139	COBB CAT CO ISO TR	160	0	0		160	34	CATTLE	16-May	18-Sep	DEFERRED ROTATION
01140	GRIEVE RESERVOIR PAS	124	0	0		124	31	CATTLE	10-Oct	15-Nov	ROTATION
01141	M. J. ANDERSON ISO #2	35	0	160		195	8	CATTLE	1-Jun	30-Sep	DEFERRED ROTATION
01142	EAST BROWNS HILL	493	608	1,516		2,617	106	CATTLE	1-Jun	31-Oct	DEFERRED ROTATION
01143	L. U. GRIEVE PASTURE	200	0	0		200	49	CATTLE	1-Mar	30-Apr	ROTATION
01144	COALBANK DRAW	240	0	661		901	64	CATTLE	1-May	2-Jul	ROTATION
01145	WALTERS HOMESTEAD	160	0	560		720	36	CATTLE	1-May	30-Jun	ROTATION
01200	TIMNATH FARMS	40	0	1,677		1,717	10	CATTLE	15-May	30-Dec	PERMIT LONG
01201	GASPAR	160	0	3,360		3,520	58	CATTLE	1-Jun	25-Oct	PERMIT LONG
01202	SPRING CREEK	200	0	680		880	220	CATTLE/ HORSE	21-Jun	20-Sep	PERMIT LONG
01203	FARTHING RANCH	650	0	0		650	75	CATTLE	1-Jun	31-Oct	PERMIT LONG
01204	FERGUSON RANCH "A"	360	0	0		360	52	CATTLE	15-May	20-Oct	PERMIT LONG
01205	ARMADILLO	160	0	200		360	18	CATTLE	15-May	29-Sep	PERMIT LONG
01207	A. E. HODGSON	40	0	600		640	11	CATTLE	10-Jun	30-Sep	PERMIT LONG
01208	SAND CREEK	40	320	1,917		2,277	8	CATTLE	1-Jul	1-Nov	PERMIT LONG
01209	LAZY D	61	0	0		61	15	CATTLE	10-May	30-Oct	PERMIT LONG
01210	N. CROW CREEK	2,676	640	14,300		17,616	573	CATTLE	22-Jun	30-Sep	PERMIT LONG
01211	MCINTYRE DRAW	320	0	0		320	64	CATTLE	10-Jun	30-Sep	PERMIT LONG
01212	J. D. MCLEES	1,160	0	0		1,160	135	CATTLE	10-May	31-Oct	PERMIT LONG
01213	BRUSH CREEK	404	0	80		484	80	CATTLE	1-Jun	30-Sep	PERMIT LONG
01214	HOCKERSMITH	320	0	1,920		2,240	80	CATTLE	10-May	30-Sep	PERMIT LONG
01215	SOAPSTONE GR. ASSN.	40	0	0		40	10	CATTLE	15-Apr	31-Oct	PERMIT LONG
01216	SWITZER	40	0	0		40	8	CATTLE	10-May	30-Sep	PERMIT LONG
01218	LODGEPOLE CR.	480	0	0		480	120	CATTLE	1-Jul	30-Nov	PERMIT LONG
01219	ANDRES WILLADSEN	40	0	0		40	8	CATTLE	1-Jun	30-Sep	PERMIT LONG
01220	S OF HAPPY JACK	77	0	640		717	0	CATTLE			NO PERMIT
01221	THREEMILE	724	320	1720		2,764	9	CATTLE	1-Jun	30-Nov	PERMIT LONG

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01222	LONG	320	0	200		520	32	CATTLE	1-Jun	15-Sep	PERMIT LONG
09001	ANCHOR RANCH	160	0	0		160	72	HORSE	1-May	30-Sep	PERMIT LONG
09002	ANDERSON	240	560	560		1,360	60	CATTLE	1-Jun	30-Sep	PERMIT LONG
09003	HAY DRAW	280	100	1,781		2,161	32	CATTLE	10-May	30-Sep	PERMIT LONG
09004	ROGERS CREEK	960	180	2,936		4,076	112	CATTLE	10-May	30-Sep	PERMIT LONG
09005	BAILEY ATKINSON	2,190	0	0		2,190	375	CATTLE	1-Aug	6-Feb	PERMIT LONG
09006	KEN ATKINSON	2,081	721	2,521		5,323	359	CATTLE	1-May	30-Nov	PERMIT LONG
09007	DALE CREEK	40	0	5,075		5,115	12	CATTLE	1-May	15-Jul	PERMIT LONG
09008	DUTTON CREEK SOUTH	320	0	2,240		2,560	74	CATTLE	1-May	30-Sep	PERMIT LONG
09009	WLX	3,536	0	0		3,536	501	CATTLE	15-May	30-Sep	PERMIT LONG
09010	SQUAW RANCH	40	0	1,590		1,630	10	CATTLE	15-Jul	1-Nov	PERMIT LONG
09011	BESSIE BATH	785	0	0		785	168	CATTLE	10-May	31-Oct	PERMIT LONG
09012	BATH BROTHERS	1,240	0	5,430		6,670	310	CATTLE	1-May	10-Oct	PERMIT LONG
09013	IRON MOUNTAIN	4,272	0	0		4,272	762	CATTLE	1-Jul	30-Sep	PERMIT LONG
09014	BELL-OTTE RANCH	1,715	1,640	5,280		8,635	115	CATTLE	1-Jun	30-Sep	PERMIT LONG
09015	SQUAW CREEK	40	0	200		240	4	CATTLE	15-Apr	10-Nov	ROTATION
09016	DUNN ALLOTMENT	80	0	2,144		2,224	13	CATTLE	15-Apr	10-Nov	ROTATION
09017	THE BUTTES	320	0	420		740	48	CATTLE	25-May	30-Aug	PERMIT LONG
09018	N. LODGEPOLE CR.	160	0	1,440		1,600	37	CATTLE	1-Jun	31-Oct	PERMIT LONG
09019	ANTELOPE CREEK	1,042	0	5,085		6,127	260	CATTLE	1-Jun	31-Aug	PERMIT LONG
09020	BOVEE HORSE PASTURE	80	0	0		80	8	HORSE	1-Mar	28-Feb	YEARLONG PERMIT
09021	BOVEE	2,710	0	0		2,710	379	CATTLE	20-May	21-Sep	PERMIT LONG
09022	GIBBS PLACE	1,664	160	1,440		3,264	282	CATTLE	1-Jun	30-Sep	PERMIT LONG
09023	WHEATLAND TUNNEL	2,091	10	2,304		4,405	352	CATTLE	1-Jun	30-Nov	PERMIT LONG
09024	WHEATLAND RES #2	800	0	0		800	132	CATTLE	1-Jun	30-Sep	ROTATION
09025	JAMES LAKE	4,538	0	0		4,538	676	CATTLE	1-Jun	15-Sep	PERMIT LONG
09026	WAECHTER CANYON	917		3,448		4,365	206	CATTLE	10-May	30-Sep	PERMIT LONG
09027	WOODROW BROW	1,680	1,116	240		3,036	165	CATTLE	1-May	28-Nov	PERMIT LONG
09028	BEAR HEAD MOUNTAIN	80	640	640		1,360	8	CATTLE	1-May	31-Dec	PERMIT LONG
09029	INDIAN ROCK	680	0	0		680	110	CATTLE	10-May	15-Oct	PERMIT LONG

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
09030	BURNETT CREEK	3,071	720	6,016		9,807	371	CATTLE/ SHEEP	15-Apr	1-Oct	PERMIT LONG
09031	PINTO ROCKS	849	640	12,267		13,756	81	CATTLE	1-Apr	15-Nov	ROTATION
09032	J.H. BUTLER	41	0	0		41	7	CATTLE	1-May	1-Nov	ROTATION
09033	CARLIN RANCH	1,948	0	39,360		41,308	300	CATTLE	1-May	31-Oct	ROTATION
09034	PALMER CANYON	280	0	1,600		1,880	71	CATTLE	1-May	31-Dec	PERMIT LONG
09035	CHALK HILLS DRY CR	18,682	1,922	14,461		35,065	2,724	CATTLE/ SHEEP	15-May	14-Nov	DEFERRED ROTATION
09036	PINE RIDGE	240	640	6,580		7,460	55	CATTLE	1-May	31-Oct	PERMIT LONG
09037	BULL CAMP PEAK	4,274	1,280	20,352		25,906	604	CATTLE	15-May	15-Sep	ROTATION
09038	ERVIN CORL	40	0	960		1,000	7	CATTLE	1-Jun	1-Oct	PERMIT LONG
09039	CROONBERG RANCH	1,440	0	3,222		4,662	215	CATTLE	1-Jun	30-Sep	PERMIT LONG
09040	PARSONS CREEK	1,680	0	2,280		3,960	93	CATTLE	1-Jun	31-Oct	PERMIT LONG
09041	DAVIDSON CREEK	6,005	720	5,267		11,992	882	CATTLE	1-Jun	30-Oct	PERMIT LONG
09042	CROSS ISOLATED TRACT	120	0	0		120	18	CATTLE	1-Jun	15-Oct	PERMIT LONG
09043	OWEN CREEK	395	600	1,320		2,315	66	CATTLE	1-May	31-Dec	PERMIT LONG
09044	WHEATLAND # 3	4,745	1,280	16,877		22,902	1,218	CATTLE	10-May	10-Oct	ROTATION
09045	NORTH FORK	320	0	0		320	54	CATTLE	10-Jun	20-Sep	DEFERRED ROTATION
09046	DALE CREEK	240	0	6,358		6,598	0	CATTLE			NO PERMIT
09047	JUNCTION	840	840	1,368		3,048	182	CATTLE	1-Jun	30-Nov	ROTATION
09048	CARROLL	520	0	0		520	134	CATTLE	10-May	30-Sep	PERMIT LONG
09049	DOUBLE K RANCH	798	0	0		798	181	CATTLE	1-Apr	30-Nov	ROTATION
09050	DUMBELL RANCH CO.	80	1,190	6,865		8,135	8	CATTLE	10-Apr	30-Sep	PERMIT LONG
09051	MULE-ROGERS CR.	7,292	1,920	4,203		13,415	1,683	CATTLE	15-May	15-Nov	PERMIT LONG
09052	SPRING CREEK	1,462	0	2713		4,175	298	CATTLE	1-May	30-Sep	PERMIT LONG
09053	STRAIN	155	0	160		315	13	CATTLE	1-May	31-Oct	PERMIT LONG
09054	WOODS LANDING	238	0	1,902		2,140	46	CATTLE	1-Aug	31-Oct	PERMIT LONG
09055	FERGUSON RANCH "C"	258	0	0		258	31	CATTLE	15-May	31-Oct	PERMIT LONG
09056	PR5 RANCH	1,001	760	5,560		7,321	148	CATTLE	10-Nov	31-May	ROTATION
09057	SOUTH FORK	1,033	640	6,044		7,717	167	CATTLE	15-Jun	15-Oct	PERMIT LONG
09058	40 MILE CREEK	80	360	600		1,040	16	CATTLE	1-Jun	31-Oct	PERMIT LONG

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
09059	CHARLES GARRETT	640	0	0		640	67	CATTLE	1-Jun	15-Jul	ROTATION
09060	SYBILLE CR.	1,124	965	2,760		4,849	169	CATTLE	15-May	15-Sep	PERMIT LONG
09061	WARREN GEORGE	4,781	718	5,471		10,970	554	CATTLE	1-Jun	22-Nov	PERMIT LONG
09062	WILLIAM GOODRICH	1,522	0	0		1,522	174	CATTLE	1-May	14-Oct	PERMIT LONG
09063	JMS RANCH	160	0	0		160	40	CATTLE	10-May	30-Sep	PERMIT LONG
09064	MENTER-RATTLESNAKE	719	0	838		1,557	58	CATTLE	1-Apr	31-Dec	PERMIT LONG
09065	THE BOWL	240	0	1,130		1,370	42	CATTLE	1-May	20-Oct	ROTATION
09066	WEST FORK	1,680	1,280	3,357		6,317	294	CATTLE	1-May	20-Sep	PERMIT LONG
09067	ANTELOPE BASIN	1,655	1,391	6,353		9,399	324	CATTLE	25-Jun	18-Oct	DEFERRED ROTATION
09068	ROCK CREEK	1,888	640	10,293		12,821	286	CATTLE	1-Apr	19-Nov	DEFERRED ROTATION
09069	COOPER LAKE	3,990	1,205	15,919		21,114	880	CATTLE	1-May	20-Sep	PERMIT LONG
09070	CANYON CREEK	80	1,040	4,700		5,820	8	CATTLE	1-Mar	31-Oct	DORMANT SEASON
09071	SLATE CREEK	477	0	0		477	46	CATTLE	1-May	31-Oct	PERMIT LONG
09072	HARRIS RANCH	2,603	0	0		2,603	465	CATTLE	10-May	30-Sep	PERMIT LONG
09073	WEBB LAKE	520	0	3,176		3,696	85	CATTLE	1-May	31-Oct	PERMIT LONG
09074	ELK HORN	5,093	639	6,490		12,222	1,110	CATTLE	15-May	15-Sep	PERMIT LONG
09075	SCHICK	160	0	480		640	43	CATTLE	10-May	30-Sep	PERMIT LONG
09076	DOWNEY LAKES SOUTH	160	0	1,490		1,650	42	CATTLE	15-May	15-Sep	PERMIT LONG
09078	TIMBER CANYON	1,162	160	6,022		7,344	113	CATTLE	1-Mar	30-Nov	PERMIT LONG
09079	COLE	120	0	1,272		1,392	30	CATTLE/ SHEEP	1-May	1-Nov	DEFERRED ROTATION
09080	MILLER	40	0	17		57	6	HORSE	1-Sep	15-Oct	DORMANT SEASON
09081	COALBANK	40	840	1,280		2,160	10	CATTLE	1-Jun	31-Aug	PERMIT LONG
09082	GOVERNMENT CREEK	160	0	3,871		4,031	25	CATTLE	1-May	Sep-31	PERMIT LONG
09083	BAMFORD	393	1,600	2,240		4,233	85	CATTLE	1-Jun	30-Nov	PERMIT LONG
09084	HAMILTON SPRINGS	2,283	0	2,084		4,367	570	CATTLE	1-Jun	31-Oct	PERMIT LONG
09085	NORTH SYBILLE CREEK	80	0	1,418		1,498	3	CATTLE	10-Apr	30-Sep	PERMIT LONG
09086	BAR M MOUNTAIN	635	0	1,556		2,191	45	CATTLE	1-Jun	30-Nov	PERMIT LONG
09087	KENNEDY	648	0	4,256		4,904	60	CATTLE	1-May	30-Sep	PERMIT LONG

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
09089	RIVER BASIN	3,077	917	3,317		7,311	205	CATTLE	1-Mar	28-Feb	ROTATION
09090	DODGE CREEK RANCH	318	640	2,237		3,195	88	CATTLE	15-May	15-Nov	PERMIT LONG
09091	LEAZENBY LAKE	40	0	340		380	10	CATTLE	1-Jun	1-Dec	PERMIT LONG
09092	STEAMBOAT ROCK	4,792	0	16,803		21,595	654	CATTLE	15-Jun	10-Sep	PERMIT LONG
09093	W. J. LOGAN	40	0	0		40	0	CATTLE			NO PERMIT
09094	IRVINE JE AND GA	2,002	0	0		2,002	438	CATTLE	1-May	31-Oct	PERMIT LONG
09095	JAMES ATKINSON	120	0	1,600		1,720	15	CATTLE	20-May	1-Jul	PERMIT LONG
09096	BOSWELL RANCH	2,243	680	1,741		4,664	299	CATTLE	15-May	15-Oct	PERMIT LONG
09098	ROCK CREEK LAKES	320	1,600	5,467		7,387	34	CATTLE	1-May	31-Oct	PERMIT LONG
09099	MCGILL	797	0	1360		2,157	77	CATTLE	10-May	30-Sep	ROTATION
09100	PARADISE CREEK	80	0	640		720	6	CATTLE	1-May	30-Oct	PERMIT LONG
09101	IONE	200	640	1,720		2,560	30	CATTLE	1-May	31-Oct	PERMIT LONG
09102	SHEEP ROCK	99	560	2,111		2,770	4	CATTLE	10-Aug	31-Nov	PERMIT LONG
09103	PINTO CREEK	2,840	640	6,760		10,240	370	CATTLE	16-May	31-Oct	PERMIT LONG
09104	NORTH SPRAGUE	640	5,128	10,720		16,488	123	CATTLE	1-May	20-Sep	PERMIT LONG
09105	RING MOUNTAIN	9,650	2,378	3,209		15,237	1,181	CATTLE	1-Jun	30-Nov	PERMIT LONG
09106	MILL CREEK	253	240	2,536		3,029	58	CATTLE	1-May	31-Oct	PERMIT LONG
09107	POE MTN-CANYON CREEK	1,360	640	4,041		6,041	161	CATTLE	1-Jun	31-Oct	PERMIT LONG
09108	MCKECKNIE MEADOWS	56	0	1732		1,788	14	CATTLE	1-Jun	31-Oct	PERMIT LONG
09109	STROUSE HILL	11,606	5,113	38,443		55,162	1,480	CATTLE	1-Mar	20-Sep	DEFERRED ROTATION
09110	PLUMBAGO CANYON	160	0	480		640	73	CATTLE	15-Jun	15-Aug	PERMIT LONG
09113	SHEEP CREEK	427	407	6,479		7,313	103	CATTLE	16-Jun	15-Oct	PERMIT LONG
09114	MORGAN & EDWARDS	160	0	0		160	15	CATTLE	10-May	30-Oct	PERMIT LONG
09115	NEEDMORE RANCH	1,570	0	0		1,570	136	CATTLE	1-Jun	30-Oct	PERMIT LONG
09117	DOWNEY LAKES	380	0	0		380	0	CATTLE			NO PERMIT
09118	EAST JELM MOUNTAIN	1,534	0	2,804		4,338	259	CATTLE	15-May	31-Oct	PERMIT LONG
09119	HOLLAND LEASE	440	0	280		720	83	CATTLE	15-May	15-Oct	PERMIT LONG
09120	SUNRISE CREEK	1,020	0	684	1,020	2,724	182	CATTLE	1-Jun	20-Oct	PERMIT LONG
09121	PALMER	160	0	360		520	25	CATTLE	1-Jan	28-Feb	DORMANT SEASON

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
09122	HECHT	37	117	800		954	4	CATTLE	1-Jun	30-Sep	PERMIT LONG
09123	HALLECK CANYON	1,885	1,280	7677		10,842	236	CATTLE	1-May	31-Dec	REST ROTATION
09124	BOSLER CANAL #3	120	640	5,194		5,954	36	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
09126	BONE CREEK	4,480	1,280	8,960		14,720	844	CATTLE	1-Jun	30-Nov	PERMIT LONG
09127	C. U. RANCH, INC.	880	241	1,043		2,164	114	CATTLE	17-Jun	31-Dec	ROTATION
09128	R. O.	195	640	3,525		4,360	35	CATTLE	15-May	15-Oct	PERMIT LONG
09129	RED MOUNTAIN	78	0	0		78	20	CATTLE	1-May	31-Oct	DEFERRED ROTATION
09130	BUFORD	110	0	0		110	38	GOAT	1-Mar	28-Feb	YEARLONG PERMIT
09131	DALE ROBBINS	959	0	2,638		3,597	194	CATTLE	15-Jun	30-Sep	PERMIT LONG
09132	ROBBINS	2,956	0	10,097		13,053	414	CATTLE	1-Jun	31-Aug	PERMIT LONG
09133	GREEN CREEK	564	0	0		564	57	CATTLE	1-Aug	30-Nov	PERMIT LONG
09134	HOLADAY PLACE	241	0	640		881	35	CATTLE	1-Jun	31-Jul	PERMIT LONG
09135	BADGER CREEK	353	0	0		353	26	CATTLE	1-Jul	30-Sep	PERMIT LONG
09136	TWENTYMILE DRAW	4,977	1,680	13,305		19,962	940	CATTLE	1-Mar	31-Sep	PERMIT LONG
09137	CROSS C RANCH	1,920	0	0		1,920	146	CATTLE	1-May	31-Oct	PERMIT LONG
09138	LOOKOUT RANCH	3,534	1,417	5,030		9,981	769	CATTLE	1-May	31-Sep	PERMIT LONG
09139	SAND CREEK RANCH	320	0	0		320	98	CATTLE	1-Jun	31-Oct	PERMIT LONG
09140	SANDERS	77	0	0		77	13	CATTLE			NO PERMIT
09141	MULE CREEK	1,433	2,000	6,450		9,883	146	CATTLE	1-May	30-Nov	PERMIT LONG
09142	JW/ SHEEP MTN RANCH	3,947	640	16,645		21,232	789	CATTLE	1-May	15-Oct	PERMIT LONG
09143	BREES	640	640	5,375		6,655	180	CATTLE	1-Jul	30-Oct	PERMIT LONG
09144	MONAGHAN RANCH	600	1,080	7,120		8,800	143	CATTLE	1-Jun	31-Oct	PERMIT LONG
09145	BOOT HEEL	1,520	640	2,000		4,160	284	SHEEP	1-Mar	1-Jun	PERMIT LONG
09147	SOMMERS	1,824	0	4,803		6,627	279	CATTLE	1-May	30-Sep	PERMIT LONG
09148	SPRINGFIELD RANCH IN	1,040	11	3,063		4,114	250	CATTLE	15-May	31-Oct	PERMIT LONG
09149	STERRETT	120	0	0		120	16	CATTLE/ SHEEP	1-Jun	31-Oct	PERMIT LONG
09150	INDIAN CHIPS	2,240	640	18,620		21,500	279	CATTLE	15-May	15-Oct	PERMIT LONG
09151	N LARAMIE-N CR.	2,242	800	6,853		9,895	259	CATTLE	10-May	30-Sep	PERMIT LONG
09152	COYOTE CANYON	280	0	1,040		1,320	33	CATTLE	10-May	30-Sep	PERMIT LONG

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
09153	SELLERS MTN.	2,840	360	3,807		7,007	410	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
09154	MEISER CREEK	1,626	0	1050		2,676	220	CATTLE	1-Jun	30-Nov	PERMIT LONG
09155	MCFARLANE CREEK	1,308	1,760	3,253		6,321	129	CATTLE	1-Jul	1-Aug	PERMIT LONG
09156	DUCK CREEK	592	0	0		592	45	CATTLE	1-Jul	1-Aug	DEFERRED ROTATION
09157	T-K RANCH	640	0	0		640	150	CATTLE	15-May	15-Oct	PERMIT LONG
09158	TALBOTT	120	0	0		120	18	CATTLE	15-May	15-Oct	PERMIT LONG
09159	TATMAN ORIGINAL	2,796	3,520	13,754		20,070	883	CATTLE	10-May	9-Nov	DEFERRED ROTATION
09161	DIRT FARM	320	0	101		421	42	CATTLE/ SHEEP	1-Jun	28-Aug	PERMIT LONG
09164	THREE D'S & T	1,556	0	0		1,556	232	CATTLE	1-Jun	30-Sep	PERMIT LONG
09165	LITTLE LARAMIE RIVER	80	0	2,184		2,264	8	CATTLE	1-Jul	30-Sep	PERMIT LONG
09166	I-80 OVERPASS	178	0	480		658	56	CATTLE	1-Jun	30-Nov	PERMIT LONG
09167	CANYON CREEK	160	800	3,360		4,320	26	CATTLE	1-May	31-Dec	PERMIT LONG
09168	MUD SPRINGS	8,471	5,788	39,444		53,703	1,722	CATTLE	1-May	31-Dec	PERMIT LONG
09170	WARREN LUSTK "A"	2,719	1,760	27,757		32,236	280	CATTLE/ SHEEP	1-Jun	15-Oct	PERMIT LONG
09171	WARREN LVSTK "B"	320	160	3,908		4,388	32	CATTLE/ SHEEP	1-Jun	15-Oct	PERMIT LONG
09173	DUTTON CREEK SOUTH	675	1,280	8,470		10,425	146	CATTLE	15-May	31-Oct	PERMIT LONG
09174	MARIUS WILLADSEN	40	0	0		40	8	CATTLE	1-Jun	15-Oct	PERMIT LONG
09175	BERTHEL LAND & LIVE.	1,096	0	0		1,096	334	CATTLE	1-May	31-Oct	PERMIT LONG
09176	MERRIL DRAW	1,401	0	3,476		4,877	184	CATTLE	1-May	31-Oct	PERMIT LONG
09178	KIRK RANCH NATRONA	1,400	400	1,120		2,920	151	CATTLE	1-Mar	15-Nov	PERMIT LONG
09179	YANKEE DRAW	1,777	0	645		2,422	311	CATTLE	10-May	30-Sep	PERMIT LONG
09181	RIVER PASTURE	640	960	472		2,072	124	CATTLE	15-May	15-Oct	PERMIT LONG
09182	CHIMNEY ROCK	1,220	2,240	16,184		19,644	264	CATTLE	15-May	15-Oct	PERMIT LONG
09183	LARAMIE PEAK BGWR	40	0	0		40	0	CATTLE			NO PERMIT
09184	J. KENNEDY'S	1,120	800	2,080		4,000	129	CATTLE	1-May	1-Dec	PERMIT LONG
09185	N. LARAMIE RIVER	83	0	0		83	15	CATTLE	1-May	30-Sep	DEFERRED ROTATION
09186	FLAT TOP ALLOT	600	0	3,054		3,654	132	CATTLE	1-May	30-Oct	PERMIT LONG

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
09187	CHINA WALL	1,040	0	3,146		4,186	102	CATTLE	15-May	31-Oct	DEFERRED ROTATION
09188	S. MEISER CREEK	1,266	0	4,098		5,364	112	CATTLE	1-May	30-Nov	PERMIT LONG
09189	GEORGE CREEK	40	80	1,150		1,270	5	CATTLE	1-May	30-Nov	PERMIT LONG
09192	SECTION 22	640	0	0		640	64	CATTLE	15-Apr	15-Oct	DEFERRED ROTATION
09194	BLUEGRASS	1,551	640	10,466		12,657	259	CATTLE	5-May	5-Oct	PERMIT LONG
09195	SUGAR LOAF	560	0	0		560	47	CATTLE	1-Mar	31-Jul	PERMIT LONG
09196	HOLMAN	80	0	0		80	27	CATTLE	1-Apr	31-Jul	PERMIT LONG
09197	DESERT	320	0	0		320	45	CATTLE	1-Jun	31-Oct	PERMIT LONG
09199	EAST SHELDON	160	0	0		160	42	CATTLE	16-Nov	31-Oct	DORMANT SEASON
09201	IRON MOUNTAIN CR.	1,680	357	1,040		3,077	338	CATTLE	16-May	15-Oct	PERMIT LONG
09202	LOOKOUT PEAK	2,831	0	0		2,831	588	CATTLE	1-Mar	15-Oct	DEFERRED ROTATION
09203	UPPER PINE RIDGE	3,366	0	0		3,366	977	CATTLE	1-May	30-Sep	PERMIT LONG
09205	GOAT MOUNTAIN	680	0	1,262		1,942	48	CATTLE	1-Jun	30-Nov	PERMIT LONG
09206	INDIAN HEAD ROCK	464	40	304		808	37	CATTLE	15-Jun	31-Dec	PERMIT LONG
09207	MOUNTAIN INCOMMON	1,407	10	680		2,097	101	CATTLE	1-Jun	30-Sep	PERMIT LONG
09208	PLUMBAGO	410	120	1,353		1,883	36	CATTLE	1-Mar	31-Oct	ROTATION
09209	SQUAW MOUNTAIN	121	0	560		681	10	CATTLE	1-Mar	3-Jul	ROTATION
09210	TWENTYTWO MILE	3,151	0	4,039		7,190	695	CATTLE	15-May	15-Oct	PERMIT LONG
09212	COW CREEK	102	0	692		794	10	CATTLE	1-May	30-Sep	ROTATION
09213	PASCO	1,126	0	0		1,126	204	CATTLE	10-May	10-Oct	PERMIT LONG
09214	IONE LAKE	15,127	4,907	56,270		76,304	3,303	CATTLE	1-May	30-Sep	PERMIT LONG
09215	LARAMIE RIVER	480	0	0		480	89	CATTLE	1-May	1-Nov	PERMIT LONG
09216	TRAPPER SPRINGS	641	0	5,726		6,367	128	CATTLE	1-May	1-Nov	PERMIT LONG
09217	MCGILL LAKES	2,372	0	3,049		5,421	644	CATTLE	15-May	15-Oct	PERMIT LONG
09218	MOONSHINE PEAK	870	10	1,515		2,395	146	CATTLE	1-Jun	30-Nov	PERMIT LONG
09219	TRISH	3,324	0	3,272		6,596	554	CATTLE	15-May	15-Oct	PERMIT LONG
10102	STEWART CREEK	165,025	9,152	3,439		177,616	12,751	CATTLE/ SHEEP	1-Mar	30-Dec	ROTATION
10103	CYCLONE RIM	291,954	13,489	3,165		308,608	31,658	CATTLE/ SHEEP	1-Mar	28-Feb	ROTATION

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
10201	BUZZARD	51,941	12,838	11,286	4,259	80,324	11,413	CATTLE	1-Mar	30-Sep	ROTATION
10202	BUZZARD RANCH MEADOW	526	515	3,935		4,976	339	CATTLE	1-Mar	28-Feb	ROTATION
10203	CHERRY CREEK	29,500	4,261	2,012		35,773	4,842	CATTLE	1-May	18-Oct	ROTATION
10204	DESERT CLAIM	360	0	200		560	75	CATTLE	1-Jul	18-Oct	ROTATION
10205	BAR ELEVEN	51,570	1,051	1,635		54,256	11,419	CATTLE	1-Mar	28-Feb	DEFERRED ROTATION
10207	FERRIS MOUNTAIN	35,729	3,352	3,833		42,914	4,711	CATTLE	1-Mar	28-Feb	DEFERRED ROTATION
10209	JUNK CREEK	10,366	1,139	198	1,133	12,836	2,095	CATTLE	1-May	31-Oct	PERMIT LONG
10212	LONG CREEK	5,744	505	4,138	1,243	11,630	1,453	CATTLE	1-Mar	20-Dec	DEFERRED ROTATION
10215	POLE CANYON	4,985	30	447		5,462	750	CATTLE	10-Jul	9-Oct	ROTATION
10216	SAND CREEK	2,309	192	341	1,074	3,916	402	CATTLE	1-Apr	31-Oct	PERMIT LONG
10217	SAND CR. RANCH PAST.	796	645	2,578		4,019	108	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
10218	SEMINOE	80,025	4,821	66,309	6,548	157,703	11,066	CATTLE	1-Mar	28-Feb	DEFERRED ROTATION
10219	STATION 8	5,570	0	0	423	5,993	804	CATTLE	21-May	30-Nov	ROTATION
10220	TAPERS	770	0	160		930	99	CATTLE	1-Jun	11-Oct	PERMIT LONG
10221	STONE	77,920	6,956	22,972		107,848	12,898	CATTLE/ SHEEP	1-Mar	30-Oct	PERMIT LONG
10222	WOOD CREEK	1,522		361		1,883	282	CATTLE	1-May	15-Oct	PERMIT LONG
10400	NORTH SAVERY CREEK	120	2,070	846		3,036	31	CATTLE	10-May	25-Sep	ROTATION
10442	HORSE PASTURE	160	160	1,240		1,560	24	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
10501	ADAM'S RANCH	26	0	119		145	6	CATTLE	1-Mar	28-Feb	ROTATION
10502	ADOBE TOWN	31,155	400	0		31,555	1,934	CATTLE/ SHEEP	1-Oct	28-Feb	DORMANT SEASON
10503	BIG ROBBER	16,499	960	25		17,484	1,623	CATTLE	15-Apr	31-Oct	PERMIT LONG
10504	BIG ROBBER SPREADERS	1,042	0	0		1,042	114	CATTLE	15-Apr	25-May	PERMIT LONG
10506	CONTINENTAL	26,228	22	40		26,290	3,406	CATTLE	1-May	31-Oct	ROTATION
10508	COTTONWOOD HILL	13,794	630	24		14,448	1,060	CATTLE	1-Apr	31-Oct	DEFERRED ROTATION
10509	COW CREEK	64,681	1,520	1,522		67,723	2,629	CATTLE/ SHEEP	1-Mar	31-Oct	ROTATION

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
10510	CROOKED WASH	7,269	0	0		7,269	87	CATTLE	1-Jun	31-Oct	ROTATION
10511	ESPITALIER	23,791	323	641		24,755	3,061	CATTLE	1-Jun	31-Oct	ROTATION
10512	GRINDSTONE SPRINGS	8,958	80	0		9,038	462	SHEEP	1-Nov	28-Feb	DORMANT SEASON
10513	LITTLE POWDER MTN	16,197	640	280		17,117	2,217	CATTLE/ SHEEP	1-Mar	15-Dec	ROTATION
10515	MEXICAN FLATS	15,077	710	0		15,787	1,695	CATTLE/ SHEEP	15-Mar	30-Nov	ROTATION
10516	MEXICAN GRAVES	18,113	2,080	80		20,273	1,493	CATTLE/ SHEEP	15-Nov	30-Sep	ROTATION
10517	OPPENHEIMER	12,088	0	1,853		13,941	1,182	CATTLE	1-May	30-Sep	DEFERRED ROTATION
10518	POISON BUTTES	5,815	422	320		6,557	696	CATTLE	1-Apr	31-Oct	DEFERRED ROTATION
10519	POWDER MOUNTAIN	8,922	640	640		10,202	923	CATTLE/ SHEEP	1-Apr	31-Oct	PERMIT LONG
10520	POWDER RIM ROTATION	46,532	0	280		46,812	5,839	CATTLE/ SHEEP	1-Mar	30-Nov	DEFERRED ROTATION
10521	RED CREEK	31,916	0	280		32,196	2,924	CATTLE/ SHEEP	1-Mar	28-Feb	YEARLONG PERMIT
10522	RIVER BOTTOM	333	0	0	642	975	281	CATTLE	1-Apr	15-Nov	DEFERRED ROTATION
10523	ROTTEN SPRINGS	20,956	40	0		20,996	1,573	CATTLE/ SHEEP	1-Dec	31-Aug	ROTATION
10524	SAND CREEK	29,421	0	0		29,421	3,377	CATTLE/ SHEEP	15-Nov	10-Apr	DORMANT SEASON
10525	SOUTH BARREL	9,311	720	198		10,229	778	CATTLE/ SHEEP	25-Mar	5-Jun	ROTATION
10526	SOUTH FLAT TOP	17,727	640	480		18,847	1,592	CATTLE	15-Apr	15-Nov	ROTATION
10527	V SPREADERS	320	0	0		320	150	CATTLE	1-Sep	24-Nov	ROTATION
10528	WILLOW CREEK	74,393	837	1,212		76,442	5,698	CATTLE	1-Nov	28-Feb	DORMANT SEASON
10529	HEADQUARTERS RANCH	142	320	150		612	25	CATTLE/ SHEEP	1-Mar	28-Feb	ROTATION
10530	SOUTH MUDDY	1,562	0	0		1,562	103	CATTLE	1-Apr	31-Oct	ROTATION
10531	GEORGE DEW	400	0	450		850	62	CATTLE	1-Nov	28-Feb	PERMIT LONG
10532	44 RANCH	888	218	690		1,796	59	CATTLE	1-May	31-Oct	ROTATION

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
10601	BADWATER	10,251	1,280	10,246		21,777	1,201	SHEEP	15-Apr	30-Nov	DORMANT SEASON
10602	BULL CANYON	3,076	0	4,612		7,688	748	CATTLE	15-Apr	31-Oct	PERMIT LONG
10604	COALBANK WASH	3,833	0	3,836		7,669	480	CATTLE	1-Jun	31-Oct	DEFERRED ROTATION
10607	ECHO SPRINGS	20,863	1,320	22,732		44,915	2,304	CATTLE	1-Apr	31-Oct	DEFERRED ROTATION
10608	EMIGRANT	1,285	840	4,661		6,786	85	CATTLE	1-Mar	28-Feb	DEFERRED ROTATION
10609	FILLMORE	17,449	640	21,834		39,923	3,374	CATTLE	15-May	20-Sep	DEFERRED ROTATION
10610	SOUTH LACLEDE	34,328	41	18,519	7,548	60,436	3,531	SHEEP/ CATTLE	1-Mar	28-Feb	ROTATION
10611	NORTH BARREL	31,419	600	26,540		58,559	2,930	CATTLE	1-Nov	30-Apr	DORMANT SEASON
10612	NORTH PINE BUTTE	1,316	0	1,034		2,350	116	CATTLE	1-Apr	31-Oct	ROTATION
10613	NORTH LACLEDE	16,934	0	20,759	4,028	41,721	939	SHEEP	1-Mar	10-Apr	ROTATION
10614	OLSON RANCH PASTURE	240	0	0		240	50	CATTLE	1-Jun	17-Sep	PERMIT LONG
10615	RINER	21,663	1,434	28,216	5,762	57,075	3,134	CATTLE	1-Mar	15-Jan	ROTATION
10616	SIXTEEN MILE	37,513	1,280	42,716		81,509	3,628	CATTLE/ SHEEP	1-Mar	10-Nov	PERMIT LONG
10619	SOUTH RED DESERT	4,992	0	5,374		10,366	756	CATTLE	1-Mar	28-Feb	ROTATION
10620	SOUTH WAMSUTTER	14,028	1,278	15,323		30,629	1,115	CATTLE	15-Apr	30-Nov	DEFERRED ROTATION
10621	TIPTON	30,227	0	30,452		60,679	4,752	CATTLE	1-Mar	28-Feb	DEFERRED ROTATION
10623	PINE GROVE/ BOLTEN	21,606	2,329	21,781		45,716	12,800	CATTLE	1-Jun	31-Oct	DEFERRED ROTATION
10624	NORTH BAGGS	179	11	551		741	18	CATTLE	1-Mar	31-Dec	DEFERRED ROTATION
10625	SOUTH PINE BUTTE	257	0	800		1,057	34	CATTLE	7-Mar	28-Feb	ROTATION
10626	LAZY Y S RANCH	8,690	0	9,110		17,800	1,371	CATTLE	1-Mar	31-Oct	ROTATION
10720	SHAMROCK HILLS	19,556	160	19,434		39,150	1,678	CATTLE	1-Mar	28-Feb	ROTATION
10721	BRIMMER PASTURES	291	0	1,034		1,325	18	CATTLE	1-Jun	30-Nov	ROTATION
10722	CHAIN LAKES	30,629	640	30,987		62,256	0	SHEEP	15-Sep	15-Jun	PERMIT LONG
11000	TEDDY CREEK	826	0	0		826	36	CATTLE	1-Jun	15-Oct	PERMIT LONG

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
11001	A BAR A RANCH	5,788	1,270	20,869		27,927	1,101	CATTLE	1-Mar	28-Feb	ROTATION
11002	WARD GULCH	595	640	2,800		4,035	104	CATTLE	1-Jul	30-Sep	PERMIT LONG
11003	CORRAL CREEK	1,320	0	0		1,320	132	CATTLE	1-May	31-Oct	PERMIT LONG
11004	BENNETT PEAK	1,800	0	1,440		3,240	143	CATTLE	1-May	31-Oct	PERMIT LONG
11005	WOOD HILL	736	0	4,960		5,696	116	CATTLE	1-May	31-Oct	PERMIT LONG
11006	SILVER SPUR	3,075	1,280	15,427		19,782	587	CATTLE	15-May	1-Oct	PERMIT LONG
11008	MINER CREEK	3,453	640	175		4,268	284	CATTLE	25-May	25-Sep	PERMIT LONG
11011	OTTO CREEK	1,266	0	1,470		2,736	51	CATTLE	1-Jun	15-Oct	PERMIT LONG
11012	SILVER SPUR NORTH	1,348	0	0		1,348	177	CATTLE	15-May	1-Jul	PERMIT LONG
11013	TENNANT CREEK	729	0	431		1,160	127	CATTLE	15-Jun	2-Oct	SPLIT SEASON
11014	KRAFT RANCH	240	0	0		240	12	CATTLE	1-Jun	30-Sep	PERMIT LONG
11015	FLYING DIAMOND	1,081	0	120		1,201	220	CATTLE	1-Jun	1-Jul	PERMIT LONG
11016	SKYLINE	219	0	1,158		1,377	42	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
11017	COTTONWOOD	1,966	0	1,160		3,126	220	CATTLE	1-Jun	31-Oct	PERMIT LONG
11018	BEAVER CR HILLS	1,626	640	1,553		3,819	317	CATTLE	10-May	10-Sep	PERMIT LONG
11019	ALBERT H. OLDMAN	560	0	0		560	48	CATTLE	1-Jun	15-Sep	DEFERRED ROTATION
11020	EAST FORK	200	640	640		1,480	20	CATTLE	1-May	31-Oct	PERMIT LONG
11023	ARTHUR ROUSE	1,877				1,877	251	CATTLE	10-May	30-Sep	PERMIT LONG
11024	BEAVER CR HILLS	960	640	2,178		3,778	142	CATTLE	25-May	31-Oct	PERMIT LONG
11025	ENCAMPMENT RIVER	195	0	0		195	22	CATTLE	1-Jun	31-Jul	PERMIT LONG
11026	RYAN RANCHES	788	0	278		1,066	78	CATTLE	20-May	20-Sep	PERMIT LONG
11027	SANGER	5,012	0	10,454		15,466	699	CATTLE	1-May	30-Sep	PERMIT LONG
11028	PLATTOGA RANCH	2,400	0	0		2,400	236	CATTLE	15-May	15-Sep	PERMIT LONG
11029	SAULCY	3,172	588	480		4240	291	CATTLE	1-Jun	15-Sep	PERMIT LONG
11031	NORTH FORK	961	0	673		1,634	63	CATTLE	1-Jun	29-Aug	PERMIT LONG
11032	COTTON RESERVOIR	1,880	0	1,000		2,880	270	CATTLE	1-Jun	31-Oct	PERMIT LONG
11033	ANTELOPE CREEK	643	0	0		643	45	CATTLE	1-Jul	15-Sep	PERMIT LONG
11034	WIANT	320	0	0		320	27	CATTLE	20-May	31-Oct	PERMIT LONG
11036	COTTONWOOD CORRAL CR.	2,037	0	1,518		3,555	234	CATTLE	20-May	15-Sep	PERMIT LONG

Allotment Number	Allotment Name	Public Acres	State Acres	Private Acres	Other Fed Acres	Total Acres	Total Federal AUMs	Class of Livestock	On Date	Off Date	Grazing Management System
11037	RIVER MEADOWS RANCH	320	0	353		673	25	CATTLE	1-May	31-Oct	PERMIT LONG
11038	PIERSON	35	21	0		56	8	CATTLE	21-Jun	20-Sep	PERMIT LONG
11039	LITTLE BEAVER CREEK	800	640	480		1,920	160	CATTLE	1-May	31-Oct	PERMIT LONG
11041	SO. CEDAR CR.	80	120	760		960	8	CATTLE	1-May	31-Oct	PERMIT LONG
11042	DUFUNNY	240	0	820		1,060	20	CATTLE	1-Jun	30-Oct	PERMIT LONG
11043	BEAVER CR SOUTH	80	0	1,243		1,323	11	CATTLE	10-May	10-Sep	PERMIT LONG
11044	SOWDER-MCNANEY	355	640	1,710		2,705	92	CATTLE	1-May	31-Oct	PERMIT LONG
11046	PIERCE	20	0	0		20	3	CATTLE	1-May	31-Oct	PERMIT LONG
11047	HORN AND MEASON	785	0	457		1,242	67	CATTLE	1-May	31-Oct	PERMIT LONG
11048	KENNADAY	1,160	0	0		1,160	137	CATTLE	1-May	31-Oct	PERMIT LONG
11049	PROSPECT MTN.	7,869	330	1,693		9,892	1,520	CATTLE	1-Jun	15-Oct	DEFERRED ROTATION
11050	PLATT MINE	899	0	455		1,354	226	CATTLE	1-Jun	30-Sep	PERMIT LONG
11052	JOHN ROUSE	80	0	933		1,013	2	HORSE	25-May	24-Jun	PERMIT LONG
11059	HERRING RANCH PASTUR	80	0	0		80	8	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
11060	COW CAMP	350	0	464	9	823	93	CATTLE	1-Jun	25-Sep	PERMIT LONG
20223	RANCH PASTURE	56	0	299		355	9	CATTLE	1-Mar	30-Jun	PERMIT LONG
20613	PLATTE RIVER	8,018	1,280	8,410		17,708	1,577	CATTLE	1-Apr	15-Nov	ROTATION
21051	OWL CREEK	138	0	1,107		1,245	14	CATTLE	1-Mar	28-Feb	YEARLONG PERMIT
21053	RAINBOW CANYON	622	0	48		670	147	CATTLE	1-Jun	1-Sep	PERMIT LONG
21054	HEATHER CR LAND CO	40	0	0		40	4	CATTLE	10-May	31-Oct	PERMIT LONG
	PERCENTAGES	**53.3%**	**5.4%**	**40.4%**	**0.9%**	**100.0%**	**100.0%**				
	TOTALS	**3,394,338**	**343,636**	**2,571,642**	**55,650**	**6,365,266**	**469,575**				

APPENDIX 30—PROBABLE FOSSIL YIELD CLASSIFICATION (PFYC), BY FORMATION, STATE OF WYOMING

Table A30-1. Probable Fossil Yield Classification (PFYC), By Formation, State of Wyoming

Formation	Age	Class[1]	Geologic Map[2]
Adaville Formation	Upper Cretaceous	3	Kav
Alcova Limestone	Middle Triassic	3	TRc, TRPcg, TRPjs, MzPz
Almond Formation	Upper Cretaceous	3	Kal, Kmv
Amsden Formation	Pennsylvanian to Upper Mississippian	3	PIPMa, PIPM, PM, MzPz
Ankareh Formation	Upper and Lower Triassic	3	JTRnd, TRad
Aspen Shale or Formation	Lower Cretaceous	3	Ka
Arikaree Group or Formation	Miocene and Oligocene	5	Tmo
Aycross Formation	Middle Eocene	5	Ta
Bacon Ridge Sandstone	Upper Cretaceous	3	Kb, Ksb
Battle Spring Formation	Eocene to Upper Paleocene	3	Tbs
Baxter Shale	Upper Cretaceous	3	Kba
Bearpaw Formation	Upper Cretaceous	3	Kfb, Klm
Bear River Formation	Lower Cretaceous	3	Kbr
Belle Fourche Shale	Upper Cretaceous	3	Kgb, Kgbm
Bighorn Dolomite	Upper Ordovician	2	Ob, DO, OC, MDO, MO, Pzr
Bishop Conglomerate	Oligocene	3	Tbi
Blair Formation	Upper Cretaceous	3	Kbl
Blind Bull Formation	Upper Cretaceous	3	Kbb
Bridger Formation	Middle Eocene	5	Tb
Browns Park Formation	Late to Middle Miocene	2	Tm
Brule Formation	Oligocene	5	Twrb, Twr
Bug Formation	Pleistocene to Pliocene	2	QTb
Caldwell Canyon Volcanics	Pliocene and Miocene	2	Tcv
Cambrian Units	Cambrian	2	Cr, Pzr
Camp Davis Formation	Middle Miocene	2	Tcd
Carlile Shale	Upper Cretaceous	3	Kcl, Knc
Casper Formation	Permian to Pennsylvanian	3	PIPc, PIPcf, PIPM, MzPz
Chadron Formation	Oligocene and Eocene	5	Twrc, Twr
Chugwater Group or Formation	Triassic	3	JTRnd, JTRgc, TRc, TRcd, TRPcg, TRPjs, MzPz
Cloverly Formation	Lower Cretaceous	5	KJ, KJs, KJg, KTR, MzPz
Coalmont Formation	Eocene and Paleocene	3	Tco
Cody Shale	Upper Cretaceous	3	Kc, Kcf
Cokeville Formation	Lower Cretaceous	3	Kss
Colter Formation	Lower Miocene	2	Tc
Conant Creek Tuff	Upper Miocene	2	Tcc
Crandall Conglomerate	Lower Eocene	3	Tcr
Crooks Gap Conglomerate	Middle Eocene	3	Tcg
Crow Mountain Sandstone	Upper Triassic	3	TRc, TRPcg, TRPjs, MzPz
Darby Formation	Mississippian to Devonian	2	MD, MDO, Pzr
Deadwood Formation	Ordovician to Cambrian	2	OC, Pzr
Devils Basin Formation	Upper Paleocene	3	Tdb
Dinwoody Formation	Lower Triassic	3	JTRnd, TRad, TRcd, TRPcg, MzPz
Eagle Sandstone	Upper Cretaceous	3	Ket
Ellis Group	Upper to Middle Jurassic	3	KJk
Englewood Limestone	Lower Mississippian to Lower Devonian	3	MDe, Pzr

Formation	Age	Class	Geologic Map
Ericson Sandstone	Upper Cretaceous	3	Ke
Evanston Formation	Paleocene to Upper Cretaceous	3	TKe
Everts Formation	Upper Cretaceous	3	Ket
Fall River Formation	Lower Cretaceous	3	KJ
Ferris Formation	Paleocene to Upper Cretaceous	5	TKf
Flathead Sandstone	Middle Cambrian	2	OC, Cr, Pzr
Forelle Limestone	Permian	2	TRPjs, Pfs
Fort Union Formation	Paleocene	3	Tfu, Tft, Tflt, Tfl, Tftl, Tftr
Fountain Formation	Upper to Middle Pennsylvanian	2	PIPcf
Fowkes Formation	Pliocene? and Eocene	3	Tf
Fox Hills Formation	Upper Cretaceous	3	Kfh, Kfl, Kfb, Klm
Frontier Formation	Upper Cretaceous	3	Kf, Kft, Kcf, Knt
Gallatin Group or Limestone	Upper Cambrian	2	OC, Cr, Pzr
Gannett Group	Lower Cretaceous	3	Kg
Glacial Deposits	Holocene and Pleistocene	1	Qg
Goose Egg Formation	Lower Triassic to Permian	2	TRPg, TRPcg, MzPz
Greenhorn Formation	Upper Cretaceous	3	Kgb, Kgbm
Green River Formation	Middle to Lower Eocene	5	Tgl, Tglu, Tgrw, Tgt, Tgw, Tgwt, Twg
Gros Ventre Formation	Upper and Middle Cambrian	2	OC, Cr, Pzr
Guernsey Formation	Upper Devonian	2	MDg
Gypsum Spring Formation	Middle Jurassic	3	KJg, KTR, Jsg, Jst, JTR, JTRgn, JTRnd, JTRgc, MzPz
Hanna Formation	Upper Paleocene	5	Tha
Harebell Formation	Upper Cretaceous	3	Kha
Hartville Formation	Permian to Mississippian(?)	3	PIPh
Heart Lake Conglomerate	Pliocene	2	Thl
Hilliard Shale	Upper Cretaceous	3	Kh
Hoback Formation	Paleocene	5	Th
Hominy Peak Formation	Upper Eocene	3	Thp
Ice Point Conglomerate	Upper Eocene	3	Tip
Indian Meadows Formation	Lower Eocene	5	Tim, Twim
Inyan Kara Group	Lower Cretaceous	3	KJ
Jefferson Formation	Upper Devonian	2	MD, DO, MDO
Jelm Formation	Upper Triassic	3	TRc, TRPjs
Kootenai Formation	Upper Cretaceous	3	KJk
Laketown Dolomite	Upper and Middle Silurian	2	SI
Lakota Formation	Lower Cretaceous	3	KJ
Lance Formation	Upper Cretaceous	5	Kl, Klm
Landslide Creek Formation	Upper Cretaceous	5	Klc
Langford Formation	Eocene	2	Ttl, Tts
Lebo Member	Middle Paleocene	3	Tfl, Tftl, Tflt
Lewis Shale	Upper Cretaceous	3	Kle, Kfl, Klm, Kml
Lodgepole Formation	Lower Mississippian	3	PIPM, Mm, MD, MDO, MO, Pzr
Madison Limestone	Mississippian through Upper Devonian	3	Mm, PIPM, MD, MDO, MO, Pzr
Meagher Limestone	Middle Cambrian	2	OC
Medicine Bow Formation	Upper Cretaceous	3	Kmb
Meeteetse Formation	Upper Cretaceous	3	Km, Klm, Kml
Mesaverde Group or Formation	Upper Cretaceous	3	Kmv, Kal, Ke, Kr, Kbl
Minnekahta Limestone	Permian	3	Pm, Pmo, Pzr
Minnelusa Formation	Pennsylvanian	2	PIPm, Pzr
Mission Canyon Formation	Mississippian	3	PIPM, Mm, MD, MDO, MO, Pzr
Moonstone Formation	Upper Miocene	3	Tmu
Morrison Formation	Upper Jurassic	5	KJk, KJ, KJs, KJg, KTR, MzPz

Formation	Age	Class	Geologic Map
Mowry Shale	Lower Cretaceous	3	Kmr, Kmt, Knt, Kgbm, Kft
Newcastle Sandstone	Lower Cretaceous	3	Kns
Niobrara Formation	Upper Cretaceous	5	Kn, Ksn, Knt, Knc
North Park Formation	Upper Miocene	3	Tmu
Norwood Tuff	Pliocene (?) and Eocene	3	Tf
Nugget Sandstone	Jurassic(?) and Triassic(?)	3	JTRn, JTRnd, KTR, JTR, JTRgn, JTRgc, MzPz
Ogallala Group or Formation	Pliocene to Miocene	5	Tmu
Opeche Shale	Permian	2	Pmo, Pzr
Pahasapa Limestone	Mississippian	2	Pzr, MDe
Park Shale	Middle Cambrian	2	OC
Pass Peak Formation	Lower Eocene	3	Tp
Phosphoria Formation	Permian	3	Pp, PIPMa, MzPz
Pierre Shale	Upper Cretaceous	3	Kp
Pinyon Conglomerate	Paleocene to Upper Cretaceous	3	TKp
Popo Agie Member	Upper Triassic	3	TRc, TRPcg, TRPjs, MzPz
Preuss Formation or Sandstone	Upper to Middle Jurassic	3	Jst
Quadrant Formation	Pennsylvanian	2	PIPMa
Quealy Formation	Lower Cretaceous	3	Kss
Red Peak Member	Lower Triassic	2	TRc, TRPcg, TRPjs, MzPz
Rierdon Formation	Upper Jurassic	3	KJk
Rock Springs Formation	Upper Cretaceous	3	Kr
Sage Junction Formation	Lower Cretaceous	3	Kss
Salt Lake Formation	Pliocene and Miocene	3	Tsl
Satanka Shale	Permian	2	TRPjs, Pfs
Sawtooth Formation	Upper Jurassic	3	KJk
Shooting Iron Formation	Pliocene	2	Tsi
Skull Creek Shale	Lower Cretaceous	3	Kns
Smiths Formation	Lower Cretaceous	3	Kss, Kws
Sohare Formation	Upper Cretaceous	3	Kso, Ksb
South Pass Formation	Upper Miocene	3	Tmu
Spearfish Formation	Upper Triassic to Upper Permian	2	TRPs
Split Rock Formation	Middle to Early Miocene	3	
Steele Shale	Upper Cretaceous	3	Ks, Ksn
Stump Formation	Upper to Middle Jurassic	3	Jst
Sundance Formation	Upper Jurassic	5	Js, KJs, KJg, KTR, Jsg, JTR, MzPz
Sunlight Group	Upper Eocene	1	Ts, Tts
Swift Formation	Upper Jurassic	3	KJk
Tatman Formation	Lower Eocene	5	Tta
Teewinot Formation	Upper Miocene	3	Tte
Telegraph Creek Formation	Upper Cretaceous	3	Ket
Tensleep Sandstone	Permian to Pennsylvanian	2	PIPMa, PM, MzPz
Tepee Trail Formation	Upper Eocene	5	Tt
Tertiary, undiff.	Pliocene to Oligocene	3	Tu
Thaynes Limestone	Lower Triassic	3	JTRnd, TRad
Thermopolis Shale	Lower Cretaceous	3	Kmt, Kft, Knt
Thomas Fork Formation	Lower Cretaceous	3	Kss
Three Forks Formation	Upper Devonian	2	MD, DO, MDO
Tongue River Member	Upper Paleocene	3	Tftr, Tftl
Tullock Member	Lower Paleocene	3	Tft, Tflt
Twin Creek Limestone	Upper to Middle Jurassic	3	Jst
Two Ocean Formation	Eocene	2	Ttl, Tts
Wagon Bed Formation	Middle Eocene	5	Twb
Wapiti Formation	Upper Eocene	1	Twp, Tts, Ts

Formation	Age	Class	Geologic Map
Wasatch Formation	Lower Eocene	5	Tw, Tgc, Tgrw, Twc, Twd, Twg, Twk, Twlc, Twm, Twmo, Twn
Washakie Formation	Upper Eocene	5	Twa
Washburn Group	Middle Eocene	1	Taw
Wayan Formation	Lower Cretaceous	3	Kws
Wells Formation	Permian to Pennsylvanian	3	PIPMa, PIPM
White River Group	Oligocene and Eocene	5	Twr, Twrb, Twrc, Twru, Tmo
Whitewood Dolomite	Upper Ordovician	2	OC, Pzr
Wiggins Formation	Upper Eocene	5	Twi
Willwood Formation	Lower Eocene	5	Twl
Wind River Formation	Lower Eocene	5	Twdr, Twim
Winnipeg Formation	Middle Ordovician	2	OC, Pzr
Wolsey Shale	Middle Cambrian	2	OC
Woodside Formation or Shale	Lower Triassic	3	JTRnd, TRad

Notes:

[1] *Ross Secord*, Northern Great Plains Probable Fossil Yield Classification Report, *Univ. of Wyoming, 1996; Peter Robinson, David Daitch, and Jennifer Haessig*, Fossil Vertebrate Localities of Southwestern Wyoming: A Literature Search, Locality Record, and Formation Evaluation, *Univ. of Colorado Museum, BLM Contract KAA 000002, 2002; professional judgment by Dale Hanson, Regional Paleontologist, Wyoming State Office, BLM, 2002.*

[2] *As the geologic map uses special characters not available in standard font sets, the following existing characters, which seemed close to geologic symbols, were used (D. Hanson, 2002): TR–Triassic Period; IP–Pennsylvanian Period; C–Cambrian Period; @–Proterozoic and late Archean times. All other symbols are the same as those commonly used in geologic mapping.*

Source: Geologic Map of Wyoming. Compiled by Love and Christiansen, 1985.

APPENDIX 31—RFO NOXIOUS WEED PREVENTION PLAN

NOXIOUS WEED PREVENTION PRACTICES

Land Use Planning

Land use planning for noxious weed prevention involves—

- Working with Federal, county, and city planning staff and zoning committees to include consideration of noxious weed management when developing or approving plans, permits, or leases.
- Including noxious and invasive weed risk factors and prevention considerations in all environmental analyses for projects, permits, plans, and alternative development.

Surface Disturbance

Surface disturbance considerations for noxious weed prevention include the following policies—

- Minimize the amount of surface disturbance when possible to reduce the area for noxious and invasive weed establishment. Reestablish vegetation on all disturbed soil from construction, reconstruction, and maintenance activities, except road travelways.
- Reseeding should be accomplished during the first available window of opportunity.
- Require certified noxious weed-free seed or testing at a suitable laboratory before allowing the use of the seed for any reclamation or rehabilitation project.
- Require certified noxious weed-free straw or hay for use as mulch.
- Require power- or high-pressure cleaning of construction equipment prior to moving into relatively noxious weed-free areas and/or leaving known noxious weed-infested areas. This practice currently is used on multistate and multicounty projects.
- Inspect gravel pits and fill sources to insure the material comes from noxious weed-free sources.
- Monitor the construction site for noxious weed control needs until vegetation is reestablished.
- Retain reclamation bonds for noxious weed control until the site is returned to the desired vegetative condition.
- Remove noxious weed seed sources from adjacent sites or from the access route that may contaminate the construction site.

Vehicle Management

Vehicle management for noxious weed prevention includes the following policies—

- Survey roads for the presence of noxious weed sources before maintenance activities. Control noxious weeds if necessary before maintaining the roadway.

- Reseed disturbed areas that are not part of the road running surface or that are not needed for maintenance purposes.
- Retain desirable roadside vegetation to discourage noxious weeds.
- Remove noxious weed seed sources or control noxious weeds that could be picked up by passing vehicles on significant access routes.
- Require power- or high-pressure cleaning of off-road equipment before moving into relatively noxious weed-free areas.
- Ensure that noxious weed prevention and related resource protection is considered in travel management plans. Close or reduce the number of vehicle trails in noxious weed-infested areas to reduce the spread of noxious weeds.

Livestock Management

Livestock management for noxious weed prevention includes the following policies—

- Avoid trailing livestock through noxious weed infested areas. Where possible, trail on roadways where detection of noxious weeds is more likely to occur.
- Allow only certified noxious weed-free hay and grain (whole, rolled, steamed, or cubed) or pelletized feeds to be fed on federally managed lands. Emergency feeding may be exempted with written authorization from the Field Manager.
- Manage grazing allotments to prevent excessive soil disturbance at salt licks, watering sites, and other livestock concentration areas.
- Avoid grazing any reseeded sites until vegetation is well established.
- Livestock used in cultural management of noxious weeds should be held in a noxious weed-free environment for a period of time before and after moving the livestock into the noxious weed management area. This practice allows the animals to clean their digestive tract of noxious weed seeds.

Recreation Sites

Recreation site considerations for noxious weed prevention involve the following policies—

- Ensure that areas under recreation permit have onsite noxious weed control, and minimize the spread to other areas.
- Require that all pack and saddle stock use only certified noxious weed-free feeds and straw bedding.
- Sign trail heads and campgrounds for noxious weed awareness, noxious weed prevention, and noxious weed reporting techniques.

Fire and Fuels Management for Wildland Fires and Fuels/Vegetation Treatment

Fire and fuels management for wildland fires and fuels/vegetation treatment, in consideration of noxious weed prevention, includes the following policies—

- Require the cleaning of fire equipment following fire activities in noxious weed-infested areas. If possible, complete the cleaning before leaving the fire site.
- Consider noxious weed prevention measures in all fire rehabilitation plans by including the noxious weed coordinator on the rehabilitation team.
- Require certified noxious weed-free seed or testing at a suitable laboratory before allowing the use of the seed in fire rehabilitation projects.
- Emphasize "light hand" fire suppression tactics to minimize the amount of surface disturbance.
- Avoid staging equipment and resources in noxious weed areas.
- Avoid off-road travel in noxious weed-infested areas.
- A noxious weed control and monitoring plan, and a map of noxious weeds in the area, should be included as part of the environmental analysis before conducting any fuels/vegetation treatments.

Lands

Land considerations for noxious weed prevention include the following policies—

- Evaluate private lands being considered for Federal acquisition through purchase, exchange, or donation for the presence of noxious weeds.
- Include a requirement to control and manage noxious weeds on federally authorized actions.

Early Detection

Early detection for noxious weed prevention includes the following policies—

- Provide training to field personnel in the identification of noxious weed species known to occur in the area and in preventative measures they are expected to follow. Special attention should be given to equipment operators and fire personnel.
- Make noxious weed identification handbooks available to all field-going personnel.
- Make inventory and noxious weed occurrence information readily available to field personnel and personnel actively involved in planning and designing projects.
- Encourage field staff, land owners, and managers to recognize and document noxious weed populations.
- Develop education and awareness programs where visitors and users of the lands assist managers in locating and identifying new invader species.
- Conduct systematic and periodic inventories to detect new noxious and invasive weed infestations.

April 1999

Recommended By:

_____ _____

Assistant Field Manager, Support Center Date

_____ _____

Assistant Field Manager, Minerals & Lands Date

_____ _____

Assistant Field Manager, Resources Date

Approved By:

_____ _____

Field Manager, Rawlins RMPPA Date

APPENDIX 32—HAZARD MANAGEMENT AND RESOURCE RESTORATION PROGRAM

The Hazard Management and Resource Restoration Program (HMRRP) is an administrative program with emphasis on management of hazards on public lands to reduce risks to visitors and employees, restore contaminated lands, and carry out emergency response actions.

HMRRP Objectives

The objectives of the HMRRP are—

- To identify and control imminent hazards or threats to human health and/or the environment from hazardous substance releases on public lands.
- To promote working partnerships with states, counties, communities, other Federal agencies, and the private sector to prevent pollution and minimize hazardous waste on public lands.
- To provide hazardous materials management training to BLM employees and educate public land users concerning laws, rules, and standards.
- To require potentially responsible parties to undertake response actions and to pay their fair share or face cost recovery.
- To encourage public collaboration in environmental decision making.
- To inventory, assess, and manage the cleanup of hazardous substance release sites on public lands that present a potential risk to human health and/or the environment, and to promote healthy ecosystems.
- To assure that solid and hazardous waste treatment, storage, and disposal facilities that might affect public lands are properly located, designed and constructed, consistent with the law, and to prohibit Resource Conservation and Recovery Act (RCRA) temporary storage facilities on public lands.
- To reduce hazardous waste produced by BLM activities and from authorized uses of public lands through waste minimization programs that include recycling; reuse; substitution; and other innovative, safe, and cost-effective methods of pollution prevention.
- To ensure that authorized activities on public lands comply with applicable Federal, state, and local laws, regulations, policies, guidance, and procedures.
- To assure appropriate review of authorized activities and application of effective management controls to correct weaknesses.

HMRRP Mandates and Authorities

The HMRRP operates under the following specific mandates and authorities:

Executive Order

- *13148–Greening of the Government Through Leadership in Environmental Management* (2000)

Federal Laws

- *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, as amended (42 USC 9601 et seq.)
- *Resource Conservation and Recovery Act of 1976*, as amended (42 USC 6901 et seq.)
- *Emergency Planning and Community Right-to-Know Act of 1986*
- *Federal Facilities Compliance Act of 1992*
- *Oil Pollution Act of 1990*
- *Occupational Safety and Health Act of 1970* (29 USC 651 et seq.)
- *Clean Water Act of 1972*, as amended (33 USC 1251 et seq.)
- *Federal Land Policy and Management Act of 1976* (43 USC 1711-1712)
- *National Environmental Policy Act of 1972* (42 USC 4321)
- *Safe Drinking Water Act of 1974*, as amended (42 USC 300 et. seq.)
- Recreational and Public Purposes Act of 1926, as amended in 1988 (43 USC 869)

Manual Guidance

- BLM Manual Section 1703—Hazardous Materials Management
- BLM Manual Handbook H-1703-1—CERCLA Response Actions Handbook
- BLM Manual Handbook H-2101-4—Preacquisition Environmental Site Assessments

Regulations

- *National Contingency Plan Regulations* (40 CFR 300)
- Natural Resource Damage Assessment Regulations (43 CFR)

HMRRP Responsibilities

HMRRP responsibilities are divided into the following categories.

1. Hazardous Waste Management

Hazardous waste management involves—

- Oversight of BLM-authorized activities that generate, use, transport, store, or dispose of hazardous waste.

- Response to and remediation of contamination from unauthorized activities. Response actions for hazardous waste sites will be in accordance with the *National Contingency Plan* (40 CFR 300) and the *Comprehensive Environmental Response, Compensation,* and *Liability Act.* As appropriate, BLM will coordinate with local Emergency Planning committees, the State of Wyoming Department of Environmental Quality, and the U.S. Environmental Protection Agency.

- Minimizing the generation or release of hazardous wastes and pollution on BLM-administered lands and facilities. Hazardous wastes produced by BLM activities will be reduced by waste minimization programs that include recycling, "green" product substitution, reuse, and other methods of pollution prevention. BLM also encourages lessees and operators to practice waste minimization.

Under current BLM policy, no public land will be leased or permitted for storage, treatment, or disposal of hazardous waste, and public land will not be leased for sanitary landfills. However, land may be sold or exchanged for these purposes under an appropriate land action.

2. Hazard Management

Hazardous management involves mitigating various physical and environmental hazards present on BLM lands. Illegal solid waste dumping continues to be a problem on BLM-administered lands. Once located, these dumps are removed to reduce the attraction of addition dumping (which may include hazardous wastes) and minimize safety hazards. On abandoned mine sites, safety concerns include open adits, vertical shafts, abandoned equipment and structures, and explosives.

3. Emergency Response

Emergency response includes responding to contaminant releases (hazardous materials and petroleum) that pose imminent danger to human health and safety, or the environment. The Rawlins Field Office maintains an *Oil, Gas, and Hazardous Substances Spill Plan* that outlines specific response guidance for contaminant releases.

4. Liability and Risk Management

Liability and risk management involves—

- Limiting liabilities to the Government associated with hazardous material contamination on public lands.
- Evaluating the risks to human health and safety, and the environment associated with BLM programs that involve hazardous materials.

BLM policy requires identifying responsible individuals liable for hazardous substance releases on public lands. After identification, BLM will ensure that the responsible individuals clean up the contamination or reimburse BLM for incurred cleanup costs.

5. Program Support

Program support involves—

- Reviewing other BLM program plans or actions to ensure environmental and regulatory compliance. One of the highest potential sources for contaminant releases in the RMPPA is oil/gas development and associated transportation-related activities (pipelines, tanker trucks, service vehicles). Detailed management actions specific to hazardous materials usage are included as part of environmental analyses conducted for specific oil and gas field activities. In addition, to prevent or minimize environmental damage, BLM attaches stipulations to permits. Oil/gas operations and associated transportation activities also must comply with various local, state, and Federal regulations designed to reduce the potential for contaminant release and providing responsibilities for cleanup activities.

- Providing specific technical and regulatory information on hazardous material issues.

- Conducting environmental site assessments in support of realty actions and land tenure adjustments as per BLM Manual H- 2101-4 (Preacquisition Environmental Site Assessments).

Implementation of BLM activities and BLM-permitted activities is controlled through stipulations and monitoring so that actions comply with applicable Federal, state, and local laws, regulations, policies, guidance, and procedures for hazardous materials generation, use, storage, treatment, transportation, and disposal. Violations through accidental occurrences or noncompliance are possible, however the stipulations require mitigation of releases in accordance with applicable laws and regulations. Although industrial operations are regulated to minimize potential spills, accidents cannot be eliminated. Monitoring, oversight, and review of authorized activities, coupled with effective management controls, reduce the severity of impacts from releases. The HMRRP will continue to respond to contaminant releases (hazardous materials and petroleum) that pose imminent danger to human health and safety or to the environment.

The HMRRP will manage and respond to foreseeable hazards on public lands in the same manner as existing management. The program will continue to emphasize protection of public health, safety, and the environment, and compliance with the related laws, regulations, and policies.

APPENDIX 33—REASONABLY FORESEEABLE DEVELOPMENTS AND REASONABLY FORESEEABLE ACTIONS (RFD/RFA) TABLES

Where RFD/RFA projections for certain resources project no or minimal reasonably foreseeable actions during the life of the plan, those resources are not listed in this appendix. These resources include Air Quality, Cultural Resources, Paleontology, and Socioeconomics.

FORESTRY

Table A33-1. Forestry RFD/RFAs

ACTIONS	Alternative 1 - No Action	Alternative 2 Development Emphasis	Alternative 3 Protection/Conservation Emphasis	Alternative 4 Future Preferred
Million board feet (MMBF) removal per decade throughout the entire Forestry Program	10 MMBF	20 MMBF	0 MMBF	10 MMBF
Average clear-cuts size per year per decade	10 acres	100 acres	0 acres	10 acres
Acres treated by implementing Stewardship and Service Contracts to comply with current policy, i.e., Healthy Forest Initiative and Healthy Forest Restoration Act of 2003 (Hazardous fire fuels reductions, biomass removal, piling and burning, firewood removal through sales/trade, and all forest health treatments) per year per decade	50 to 250 acres	25 to 150 acres	100 to 1,500 acres	50 to 250 acres
Biomass removal through fuels reduction to promote forest health and productivity per decade	300 tons	600 tons	300 tons	300 tons
Biomass removal in the form of firewood (by sales to the public) per year per decade	250 cords	1,500 cords	250 cords	250 cords
Commercial and precommercial thinning of stands consisting of post/pole, Christmas tree, and wildling (by sales to the public) per year per decade	5,000 to 6,000 trees	25,000 trees	5,000 to 6,000 trees	5,000 to 6,000 trees
Average timber sale size (select/clear cuts)	10 (clear-cut max size) to 20 (select cut) acres	100 (clear-cut max size) to 200 (select cut) acres	20 (select cut) acres	20 acre (max select cut size) 10 acre (max clear-cut size)

ACTIONS	Alternative 1 - No Action	Alternative 2 Development Emphasis	Alternative 3 Protection/Conservation Emphasis	Alternative 4 Future Preferred
Average MMBF removal per timber sale (dependent on density of the stand)	20 to 85 MMBF	350 MMBF	20 to 85 MMBF	20 to 85 MMBF
Acres treated by commercial and precommercial thinning of stands consisting of post/poles, Christmas trees, and wildlings (by sales to the public) per year per decade	30 to 100 acres	150 acres	50 to 100 acres	30 to 100 acres

FIRE AND FUELS

Table A33-2. Fire and Fuels Management RFD/RFAs

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Wildland urban interface specific actions (burning)	Treat 100 acres, 5 treatments per year	Treat 500 acres, 20 treatments per year	Treat 300 acres, 12 treatments per year	Treat 400 acres, 16 treatments per year
Mechanical and chemical treatments	Treat 100 acres, 10 individual treatments	Treat 500 acres, 20 individual treatments	Treat 300 acres, 12 individual treatments	Treat 400 acres, 16 individual treatments
Fire management	4,000 acres/year	2,000 acres/year	10,000 acres/year	8,000 acres/year

LANDS AND REALTY

Table A33-3. Lands and Realty RFD/RFAs

Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
The demand for disposal of public land will average about 500 acres per year. That figure represents disposal via direct sale, competitive sale, or exchange. Before any disposals, lands will be examined for the presence of high-value resources. Lands containing high surface values will not be disposed of, or the disposal will provide for those values to be preserved. The Rawlins Field Office Land Exchange Criteria will be used to screen potential land exchanges for possible resource conflicts. Therefore, land disposals will not substantially affect resource programs. The effects of utility and transportation development will be mitigated individually. Generally, this will be accomplished by consolidation of new developments into existing routes or by innovative construction techniques	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.

Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
that disturb less land and improve reclamation success. Disposal of small, isolated parcels of public land would decrease the cost of public land administration in the Resource Management Plan Planning Area (RMPPA) and enhance efficiency in management of the remaining public lands. In addition, it would decrease conflicts between public land users and private landowners. Competitive sales of small, isolated parcels might lead to pricing beyond the capability of the owners of property adjacent to those parcels. If owners of adjacent or surrounding property could not purchase the isolated parcels, land use conflicts might develop. The lands program is a service program rather than an environmental component. The discussion of the effects on lands in each alternative will be limited to the effects on community expansion opportunity.			
An average of 11 acres per year will be disturbed by the construction of ditches. This equates to 220 acres in 20 years.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.
Communication site construction will disturb an average of 9 acres per year, or 180 acres over 20 years.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.
Other facilities will disturb 58 acres per year or 1,160 acres over 20 years.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.
A minimum of one new thousand-turbine windpower generation project will be constructed during the next 20 years. Location would be somewhere within the areas rated as high potential for windpower generation. The windpower facility would disturb approximately 1.94 acres per turbine during construction and 1.28 acres disturbance per turbine for the life of project. Disturbance includes pad, access road, transmission line, and substation. Construction time/equipment— (Refer to Final—*Phase 1, Plan of Development—Seawest Energy Land Associates, LLC Wind Farm Project*, October 1997). Also, refer to *Draft Kennetech/Pacific Corp Windpower EIS*, Page 2-30, Table 2.3 for typical power line construction and Pages 2-24, 2-25, and 2-26, Tables 2.5, 2.6, 2.7, and 2.8 for length of time of construction. A total of approximately 6,020 acres (total from above disturbance estimates) will be disturbed by transportation systems, energy projects, and utility systems described above, over 20 years. About 45 percent of the disturbed acreage will be revegetated through reclamation within that time.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.
Construction and improvement of roads and highways will disturb 845 acres per year.	Construction and improvement of	Construction and improvement of	Construction and improvement of

Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Approximately 95 percent of these roads will be included in the estimated acreage of disturbance per oil/gas well (see the assumptions for minerals). Therefore, over a 20-year period, the disturbance will amount to 800 acres.	roads and highways will disturb 869 acres per year. Over a 20-year period, the disturbance will amount to 828 acres.	roads and highways will disturb 695 acres per year. Over a 20-year period, the disturbance will amount to 662 acres.	roads and highways will disturb 845 acres per year. Over a 20-year period, the disturbance will amount to 800 acres.
An average of 36 acres per year would be disturbed by the installation of telephone and fiber optic cable. This would amount to 720 acres over a 20-year period. Virtually all of the disturbance from each telephone/fiber optic cable would be reclaimed within 3–4 years. In addition, many of the lines and cables rights-of-way (ROW) would overlap, thus reducing any new surface disturbances. Approximately 3.6 acres would be disturbed per mile of construction, assuming one 30-foot width ROW. Disturbance of 36 acres would occur from 10 miles of telephone ROW per year.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.
An average of 20 acres per year would be disturbed by the installation of power lines. This would amount to 400 acres over a 20-year period. Approximately 80 percent of the disturbance would be reclaimed within 3–4 years. Approximately 1.2 acres would be disturbed per mile of construction, assuming one 30-foot width ROW. Disturbance of 20 acres would occur from 17 miles of power line ROW per year.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.
Pipeline construction will disturb an average of 329 acres per year. Approximately 95 percent of this disturbance will be from oil/gas distribution lines, which are included in the estimates of disturbance per well (see the assumptions for minerals). Therefore, disturbance from transmission pipelines and water lines over 20 years will amount to 313 acres. Four years after construction, vegetation will be partially restored through reclamation.	Pipeline construction will disturb an average of 338 acres per year. Disturbance over 20 years will amount to 322 acres.	Pipeline construction will disturb an average of 270 acres per year. Disturbance over 20 years will amount to 257 acres.	Pipeline construction will disturb an average of 329 acres per year. Disturbance over 20 years will amount to 313 acres.

LIVESTOCK

Table A33-4. Livestock RFD/RFAs

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
General management direction	Existing 10-year average for number and types of projects will continue at the same level.	Increase in water development projects over existing work accomplished, but keep same general mix of projects.	Fewer new projects, emphasis on protecting existing water sources, both seeps and fencing-off reservoirs, and fence	Mixture of projects from Alternatives 2 and 3

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
			conversions rather than new fencing (to improve big game movement)	
Spring/seep protection and development	16 projects/year, disturb 4 acres	16 projects/year, disturb 4 acres	16 projects/year, disturb 4 acres	16 projects/year, disturb 4 acres
Reservoir/pit development	10 projects/year, disturb 15 acres	14 projects/year, disturb 21 acres	10 projects/year with 5 new and 5 fence existing and off-site water, disturb 10 acres	10 projects/year with 8 new and 2 fence existing and off-site water, disturb 12 acres
Wells development	4 projects/year, disturb 2 acres	8 projects/year, disturb 4 acres	4 projects/year, disturb 2 acres	4 projects/year, disturb 2 acres
Fencing development and conversion	8 projects (15 miles)/year, disturb 15 acres	8 projects (15 miles)/year, disturb 15 acres	20 projects (30 miles)/year of existing fence conversion, disturb 0 acres	13 projects/year (23 miles) with 8 new and 5 existing fence conversions, disturb 15 acres
Pipeline development	2 projects (6 miles)/year, disturb 4 acres	4 projects (12 miles)/year, disturb 8 acres	None	4 projects (12 miles)/year, disturb 8 acres
Reservoir maintenance	5 projects/year, disturb 5 acres	5 projects/year, disturb 5 acres	5 projects/year, disturb 5 acres	5 projects/year, disturb 5 acres
Totals for all projects	40 projects/year, disturb 45 acres annually	55 projects/year, disturb 57 acres annually	55 projects/year, disturb 21 acres annually	52 projects/year, disturb 46 acres annually

MINERALS

Table A33-5. Surface Disturbance from Coalbed Natural Gas (CBNG) and Gas Wells (based on figures supplied by RMG 12/10/03)

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Number of Wells	**8,945**	**9,198**	**8,632**	**8,822**
Number of wells abandoned	1,174	1,207	1,131	1,184
Number of well sites reclaimed	1,057	1,086	1,018	1,066
Gross disturbance (acres)	**61,895**	**63,649**	**56,505**	**57,819**
Gross drilling well road disturbance included in total acres	16,101	16,553	14,666	15,008
Gross drilling well road disturbance in miles	3,388	3,483	3,086	3,158
Gross acres disturbed by pipeline activity included in total acres	6,262	6,437	5,704	5,837
Net disturbance (acres)	**16,538**	**17,013**	**15,489**	**15,472**
Producing well road disturbance	12,908	13,277	11,803	12,077

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
included in total acres				
Net acres disturbed by pipeline activity	2,272	2,337	2,072	2,120

Dated: 8/26/04

Table A33-6. Solid Minerals RFD/RFAs

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Coal development	Currently two mines produce a total of less than 1 million tons per year; it is anticipated production will end by 2004. Carbon Basin has been leased, but no viable contract is known to exist to justify opening the mine. Currently in-place protections for paleontological resources provide adequate protection for these resources.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.
Other solid leasable minerals production	No known economic deposits exist. The lack of economic resources indicates no production would occur; thus, there would be no effect on paleontological resources.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.
Locatable minerals exploration	No known economically mineable deposits exist. There are known uranium deposits; however, the current and foreseeable economic climate for uranium is not conducive to active mining. It is anticipated exploration for locatable minerals will continue to occur with five notice-level activities occurring per year. The current lack of production and existing protections provide adequate protection for paleontological resources.	All acreage field office wide would be open to operation under the mining law maximizing opportunities to discover and develop new mineral reserves. A slight increase, up to two additional notice-level activities, could occur per year. Each notice-level activity would disturb 5 acres or less by regulation. Most exploration is projected to	Large acreages would be withdrawn from operation under the mining law, limiting opportunities to discover and develop new mineral reserves. The chance that paleontological resources would be inadvertently disturbed would be minimized.	Same as Alternative 1.

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
		occur in igneous/meta-morphic terrain or in recent alluviums, minimizing possible impacts on paleontological resources. Activities occurring on sensitive areas have adequate protection under existing laws and regulations.		
Disposable minerals production	Current contracts allow production of approximately 21 million tons of material over the next 10 years. It is anticipated that contracts will continue to be issued; however, the amount will decrease because, of the 21 million permitted, 20 million is in one sale. Therefore, the amount projected to be sold per year would decrease to less than 1 million tons Most current contracts are in areas of recent alluvium or, in the case of the large 20-million-ton sale, igneous terrain, neither of which is conducive to the presence of fossils. Current laws and regulations provide adequate protection for paleontological resources.	Mineral materials demand is directly tied to other development/ maintenance activities such as highway construction and development of roads for oil field use, CBNG production, and recreation access. The best estimate for future production is of a steady increase in demand of approximately 5 percent per year. The average acreage per permit is expected to be 10 acres or less because of State of Wyoming Department of Environmental Quality requirements to avoid having to obtain a small-mine permit	Areas from which mineral material disposals would be approved would be limited. A decrease in production of mineral materials of 25 to 30 percent would be expected. Chances of inadvertently disturbing paleontological resources are the same as Alternative 1.	Same As Alternative 1.

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
		rather than a 10-acre exemption. Effects on paleontological resources are the same as Alternative 1.		

OHV

Table A33-7. OHV RFD/RFAs

Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Reclamation will be done and roads closed where necessary to mitigate impacts from OHV activity. No actions requiring any use of equipment beyond normal 4-wheel drive or motorcycle mileage.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.

RECREATION

Table A33-8. Recreation RFD/RFAs

Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Reclamation will be done and developed sites closed where necessary to mitigate impacts from recreational activity. No actions requiring any use of equipment beyond normal 4-wheel drive mileage.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.

SPECIAL MANAGEMENT AREAS

Table A33-9. Special Management Area RFD/RFAs

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/Conservation Emphasis	Alternative 4 - Future Preferred
Wilderness study areas, Wild And Scenic Rivers, Continental Divide National Scenic Trail	Reclamation will be done and roads closed where necessary to mitigate impacts. No actions requiring any use of	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/Conservation Emphasis	Alternative 4 - Future Preferred
SRMA, Shirley Mountains SRMA, and North Platte River SRMA	equipment beyond normal 4-wheel drive or motorcycle mileage.			
Proposed Rawlins OHV Area SRMA—build 480-acre OHV area	Fence 480-acre OHV area, 2 sides of 20-acre children's area, and 4 sides of 20-acre staging area, and build separator fences between 5 OHV courses averaging 55 acres each (total is 11 miles of fencing). Construct and gravel 1.5 miles of road, and 5 acres of staging area. Build one accessible two-vault restroom in staging area. Construct 5 contoured OHV courses of varying difficulty, totaling approximately 275 acres. Construct elevated 0.4-mile berm for observation area. All 480 acres may be disturbed. Estimated casual use would be 40 motorcycles and 25 4-wheelers per week, 5 months of the year. In addition, there would be an estimated 6 competitive events per year with an average of 50 participants each. Average use would be 2.5 hours per participant.	Fence 480-acre OHV area, 2 sides of 20-acre children's area, and 3 sides of 20-acre staging area (total is 4.5 miles of fencing). Construct and gravel .5 mile of access road and 5 acres of staging area. Build one accessible two-vault restroom in staging area. Total surface disturbance would be approximately 7 acres. Estimated casual use would be 20 motorcycles and 15 4-wheelers per week, 5 months of the year. In addition, there would be an estimated 2 competitive events per year with an average of 30 participants each. Average use would be 1.5 hours per participant.	Same As Alternative 1.	Same As Alternative 1.

VISUAL RESOURCE MANAGEMENT

Table A33-10. VRM RFD/RFAs

Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Reclamation will be done and roads closed where necessary to mitigate visual impacts. No actions requiring any use of equipment beyond normal 4-wheel drive mileage.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

TRANSPORTATION

Table A33-11. Transportation RFD/RFAs

Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Maintenance requirements for existing planning area road network 120 miles of resource roads (crowned and ditched, surfaced or not) graded per year	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.

VEGETATION

Table A33-12. Vegetation RFD/RFAs

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Prescribed fire treatments	1,500 acres/year or 30,000 acres over 20 years (20 projects)	14,000 acres/year or 280,000 acres over 20 years (50 projects)	7,000 acres/year or 140,000 acres over 20 years (100 projects)	10,000 acres/year or 200,000 acres over 20 years (50 projects)
Chemical treatments	1,000 acres/year or 20,000 acres over 20 years (10 projects)	10,000 acres/year or 200,000 acres over 20 years (40 projects)	4,000 acres/year or 80,000 acres over 20 years (40 projects)	6,000 acres/year or 120,000 acres over 20 years (30 projects)
Mechanical treatments	0 acres of treatment	400 acres/year or 8,000 acres over 20 years (8 projects)	800 acres/year or 16,000 acres over 20 years (30 projects)	400 acres/year or 8,000 acres over 20 years (20 projects)
Total vegetation treatments	This alternative would treat 2,500 acres per year using chemical treatments or prescribed fire.	Under this alternative, approximately 24,400 acres would be treated per year with an emphasis on landscape-scale	Under this alternative, approximately 11,800 acres would be treated per year. Treatment sites would be smaller in	Under this alternative, approximately 16,400 acres would be treated per year. There would be a mixture of

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
		projects.	size and would be designed to maximize edge effect to increase wildlife habitat values. This would result in more individual treatment sites overall.	landscape-scale and smaller-scale treatment sites, depending on the specific resources determined to be of primary importance, such as meeting desired plant community (DPC) goals.

WEEDS

Table A33-13. Noxious and Invasive Weeds RFD/RFAs

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
BLM will control the noxious weeds and non-native invasive plants.	Treat 800 acres/year * (includes only noxious species)	Treat 8,000 acres/year (includes cheatgrass, saltcedar and other noxious species, and poisonous plants)	Treat 11,600 acres/year (includes saltcedar, cheatgrass and other invasive species, and noxious species)	Treat 7,700 acres/year (includes noxious and invasive)
Range improvement projects—assume 5 percent requires treatment	45 acres/year disturbed = 2 acres/year new	57 acres/year disturbed = 3 acres/year new	21 acres/year disturbed = 1 acre/year new	45 acres/year disturbed = 2 acres/year new
Prescribed fire—assume 10 percent will require treatment	1,500 acres/year disturbed = 150 acres/year new	14,000 acres/year disturbed = 1400 acres/year new	7,000 acres/year disturbed = 700 acres/year new	10,000 acres/year disturbed = 1000 acres/year new
Chemical treatments (Spike)—assume 0 percent will require treatment—no surface disturbance	1,000 acres/year disturbed = 0 acres/year new	10,000 acres/year disturbed = 0 acres/year new	4,000 acres/year disturbed = 0 acres/year new	10,000 acres/year disturbed = 0 acres/year new
Mechanical treatments—assume 0 percent will require treatment—no surface disturbance	0 acres/year disturbed = 0 acres/year new	400 acres/year disturbed = 0 acres/year new	800 acres/year disturbed = 0 acres/year new	400 acres/year disturbed = 0 acres/year new
Operations road blading—assume 10 percent requires treatment	800 acres/year disturbed = 80 acres/year new	800 acres/year disturbed = 80 acres/year new	800 acres/year disturbed = 80 acres/year new	800 acres/year disturbed = 80 acres/year new
Forestry—assume 5 percent will require	50 acres/year = 3 acres/year new	100 acres/year = 5 acres/year new	50 acres/year = 3 acres/year new	50 acres/year = 3 acres/year new

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
treatment				
Permit and ROW holders (agents) will control weeds: oil and gas-related disturbance—assume 40 percent requires treatment (probably low)(assumes same number acres disturbed last 30 years as projected for next 20 years—15 percent requires treatment—should be a conservative number)	3,095 acres/year disturbed = 1,240 acres/year new + 15,000 current acreage requiring treatment (Assume 2,000 acres/year average treated)	3,183 acres/year disturbed = 1,270 acres/year new + 15,000 current acreage requiring treatment	2,828 acres/year disturbed = 1,130 acres/year new + 15,000 current acreage requiring treatment	3,030 acres/year disturbed = 1,210 acres/year new + 15,000 current acreage requiring treatment
Realty—assume 10 percent requires treatment (non-oil and gas-related actions)	287 acres/year disturbed = 28 acres/year new	287 acres/year disturbed = 28 acres/year new	287 acres/year disturbed = 28 acres/year new	287 acres/year disturbed = 28 acres/year new
Totals	**BLM = 800 acres being treated Agents = 2,000 acres being treated	**BLM = 9,488 acres requiring treatment Agents = 16,298 acres requiring treatment	**BLM = 12,384 acres requiring treatment Agents = 16,158 acres requiring treatment	**BLM = 8,785 acres requiring treatment Agents = 16,238 acres requiring treatment

** This alternative reflects what is actually being treated and what is planned for treatment from 1994 to 2004. The difference shown in the total reflects what needs treatment vs. what is being treated.*

*** All weed treatments require standard pickup trucks, 4-wheeler, and/or walking. Some acreage will be treated with a helicopter (may average 20 hours/year Alt #1; 60 hours/year Alt #2; 100 hours/year Alt #3).*

SOILS AND WATERSHED

Table A33-14. Soils and Watershed RFD/RFAs

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Stream restoration, low impact such as using natural materials (rock or unprocessed wood) to encourage channel adjustments; heavy equipment will not be used for this action other than transportation	25 stream miles	25 stream miles	50 stream miles	25 stream miles
Headcut remediation as needed; this action could involve methods such as armoring and structures or providing aspens	10 projects	10 projects	10 projects	10 projects

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
for beaver dams. Impacts can be determined only for specific projects.				
Shallow groundwater monitoring, precipitation, and stream gaging sites needed to monitor water quality and quantity	50 sites	50 sites	50 sites	50 sites

WILD HORSES

Table A33-15. Wild Horses RFD/RFAs

Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Acres in herd management areas (HMA) would be maintained.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.
Objective populations (appropriate management levels [AML]) for HMAs will be maintained in the Stewart Creek and Adobe Town HMAs.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.
AML will be maintained at 70 wild horses in the Lost Creek HMA.	Same As Alternative 1.	AML will be increased from 70 to 165 (estimate) in the Lost Creek HMA to protect the rare and unique genetic resource (Spanish trait) found there.	Same as Alternative 1. The rare and unique genetic resource (Spanish trait) would be managed in a larger metapopulation.
Acres to be disturbed by gathering and related management activities will remain at approximately 30 until the conclusion of CY 2004, and then increase gradually to approximately 50 as the individual HMAs transition from population-reduction gathering to population-maintenance activities.	Same As Alternative 1.	Same As Alternative 1.	Same As Alternative 1.

FISHERIES

Table A33-16. Fisheries RFD/RFAs

ACTIONS	Alternative 1 - No Action	Alternative 2 - Development Emphasis	Alternative 3 - Protection/ Conservation Emphasis	Alternative 4 - Future Preferred
Barrier removal/replacement To eliminate habitat fragmentation and restore hydrologic function to provide for the life history requirements of fishes.	4 projects	2 projects	20 projects	20 projects
Stream restoration To restore streams to a state of dynamic equilibrium with the flow and sediment supplied by their watershed to provide suitable habitats for fishes.	10 miles	5 miles	50 miles	50 miles
Reintroductions To restore native fishes to portions of their historic range.	12 miles	0 miles	50 miles	50 miles
Fishing access development To provide access to quality recreational fishing opportunities.	5 developments	10 developments	2 developments	5 developments
Research projects To investigate the habitat requirements, life history strategies, and distribution of native fishes found on BLM lands in the RMPPA.	4 projects	4 projects	10 projects	10 projects

APPENDIX 34—DESIGNATED ROW CORRIDOR CRITERIA

A transportation and utility right-of-way (ROW) corridor criteria determination would be undertaken subsequent to the issuance of the Record of Decision (ROD) for this plan.

ROW Development and Selection Criteria

When a new proposal is received subsequent to the designated corridor criteria determination, the purpose would be evaluated based on the criteria listed below. Each proposal would be examined on a case-by-case basis to determine if it meets the corridor criteria. The type, compatibility, proximity to other ROWs, extent/area, and mitigation measures for a ROW would be identified prior to granting additional ROWs within any designated corridor.

The following items would be determined for each designated corridor:

- Types of ROW facilities to be allowed
- ROW activities to be allowed or restricted
- Exact location and width available within the corridor
- Non-ROW activities to be allowed, restricted, or prohibited within the proposed ROW corridor or ROW use area
- Nonstandard or administrative (i.e., resource protection) terms and conditions to be applied to specific ROW facilities that subsequently may be located within the ROW corridor or ROW use area
- Ancillary facilities and "perpendicular" access needed to efficiently gain access to the ROW corridor or ROW use area.

APPENDIX 35—SOCIOECONOMIC IMPACT ANALYSIS AND SIGNIFICANCE CRITERIA

ASSUMPTIONS AND METHODS

Significance Criteria

Significance criteria for socioeconomic impacts were determined by analyzing long-term (20-year) trends and fluctuations in certain important economic variables, including total employment and mineral ad valorem taxes associated with natural gas production for the four-county study area. This analysis evaluated the long-term trends to determine the approximate changes likely to occur in the variables under normal conditions. Deviations from the trend over this 20-year period are considered the threshold of what can be tolerated by the regional economy for these two variables. Any changes beyond these thresholds would likely cause significant impacts to local communities.

Figure A35-1 summarizes total annual employment for the study area between 1990 and 2000. It shows that total employment followed an increasing trend (of 16 percent) during this period. The trend analysis also shows that the regional economy has experienced cyclical fluctuations in employment. Therefore, although total employment increased over time, it is reasonable to assume that in any given year total employment may deviate by 1 percent above or below the trend (e.g., +1,100 to -1,100 jobs).

Deviations in total employment, as measured by the historical trend, were used to define the threshold of significance for this analysis. Thus if employment impacts due to changes in management associated with RMPPA do not exceed an increase or decrease of 1 percent of the trend, the impact is not considered significant.

The historic trend associated with mineral ad valorem taxes associated with gas production for the study area is summarized in Figure A35-2. This graph shows the estimated value, in inflation-adjusted dollars, of ad valorem taxes associated with gas production in the four-county study area. During this time ad valorem taxes have fluctuated substantially from the trend (e.g., +$29 million to -$27 million) the big spike in 2000 deviated from the trend by 29 million. Given the importance of mineral ad valorem taxes to local government entities, the significance threshold for this variable was set at 15 percent above or below the trend (e.g. +$4 million to -$4 million).

Figure A35-1. Total Employment Trend

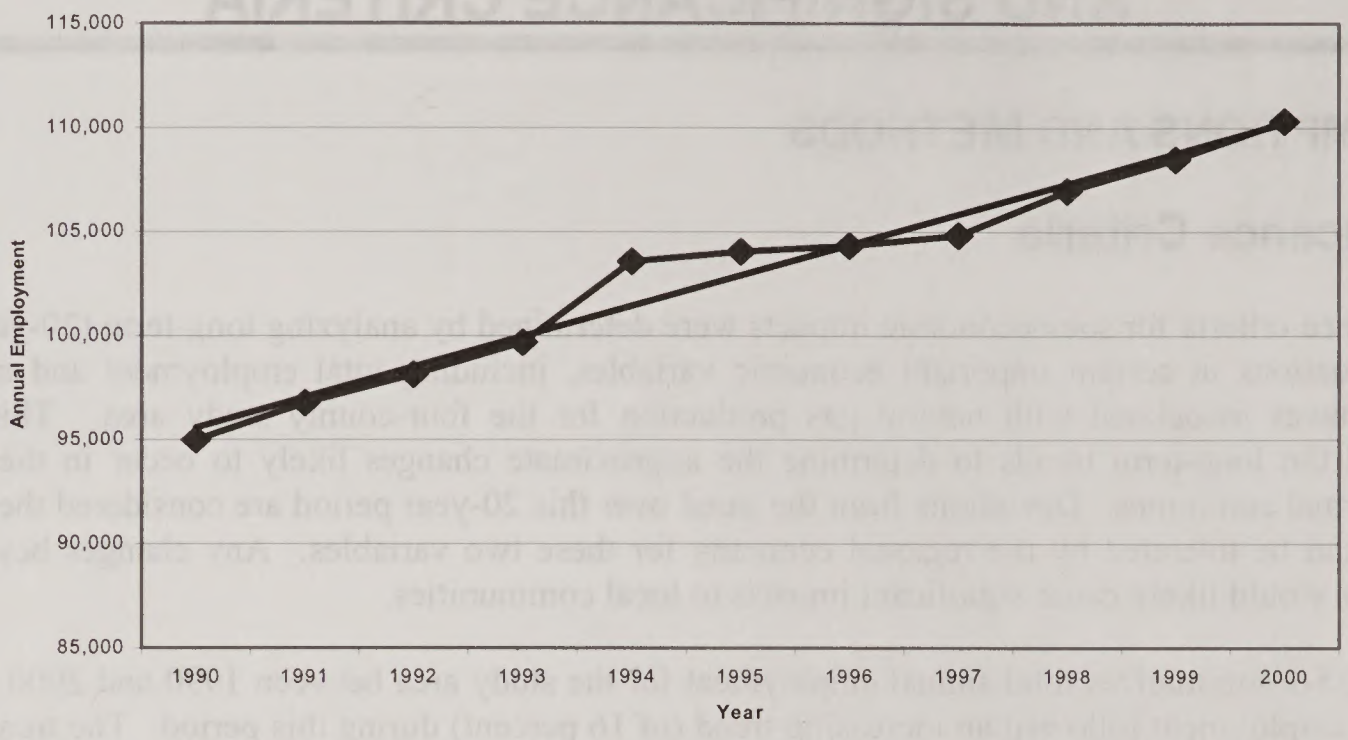
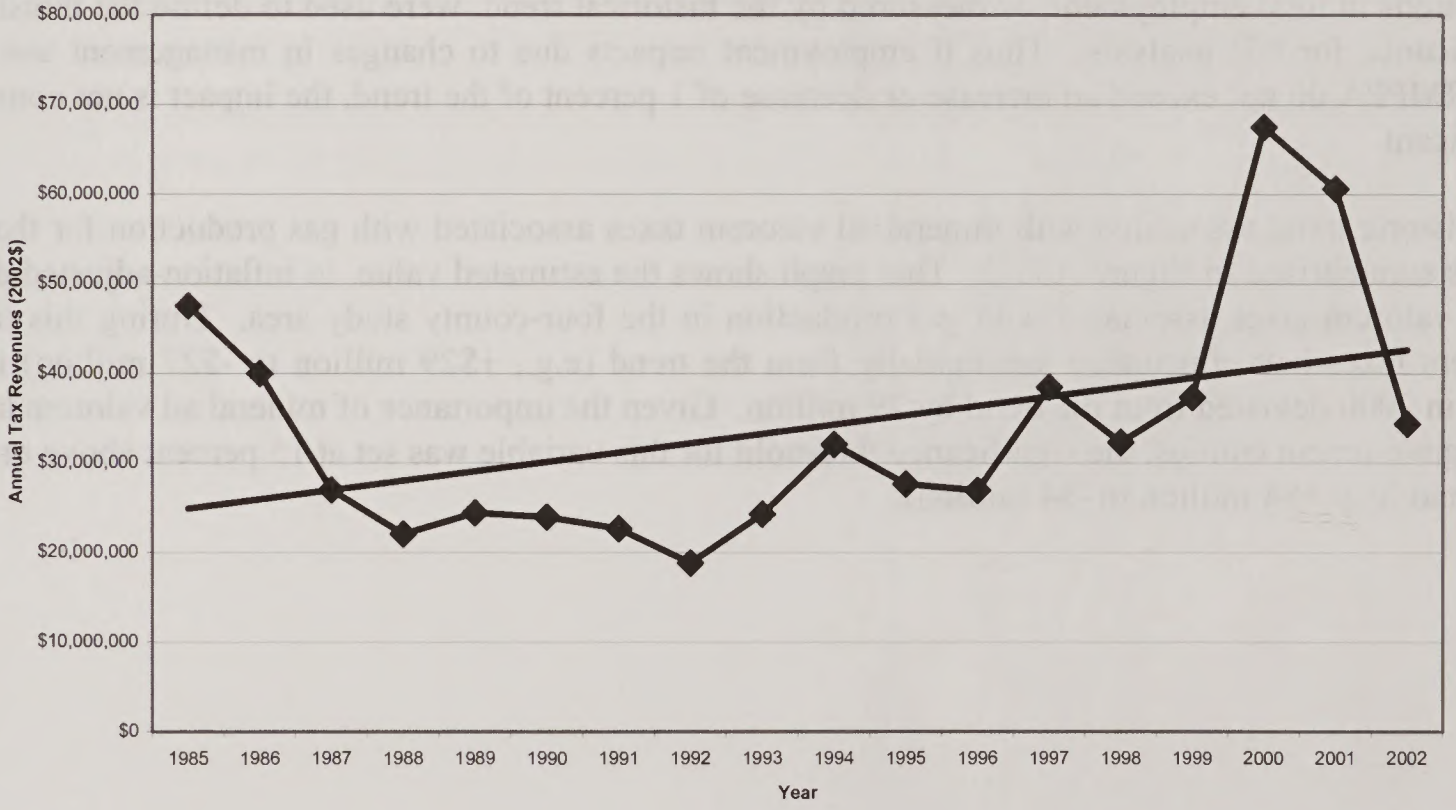


Figure A35-2. Ad Valorem Tax Trend



ECONOMIC IMPACT ANALYSIS METHODOLOGY

The following section provides a detailed summary of the economic impact analysis by resources use.

Modifications of IMPLAN for RMPPA

The Impact analysis for PLANing (IMPLAN) modeling system is based on national production coefficients. To better reflect local production practices, the oil and gas and cattle production sectors of the four-county IMPLAN model for the Rawlins *Resource Management Plan* (RMP) were modified. The IMPLAN sectors associated with recreation were not adjusted because it was felt that these sectors were a reasonably accurate representation of the sectors found in the study area.

In IMPLAN, oil and gas production is separated into three sectors (MIG, 2000): 38—Natural Gas and Crude Petroleum (production), 39—Natural Gas Liquids (byproducts), and 57—Maintenance and Repair of Oil and Gas Wells (oil and gas field services). Employment for these three sectors was estimated from Wyoming Department of Employment data on covered employment. These estimates were then adjusted to account for self-employment based on Wyoming data from the Bureau of Economic Analysis, U.S. Department of Commerce. Labor earnings for the three sectors were also estimated from Wyoming Department of Employment data. These estimates were then adjusted for self-employment earnings and benefits. Benefits were estimated from national data in the Survey of Current Business.

Total industry output for production was based on the quantities of production data in the Wyoming Department of Revenue's Annual Report, and price forecasts from the Wyoming Consensus Revenue Estimating Group (CREG). Total industry output for byproducts was estimated from information on county gas plant products from Minerals Management Services. Total industry output for oil and gas field services was estimated using output/employment ratios developed from the 1997 Economic Census, U.S. Census Bureau. Because of the large price fluctuations in natural gas and oil prices, the economic impacts of production were estimated based on cost of production rather than total output.

In IMPLAN, the cattle ranching industry is separated into two sectors: 3—Ranch Feed Cattle, and 4—Range Feed Cattle. Sheep production is represented by a single sector: 6—Sheep, Lambs, and Goats. For this analysis, sectors 3 and 4 were combined into a single Cattle Ranching sector. The production coefficients for this aggregated cattle ranching sector were then modified based on a University of Idaho Cow-Calf Budget. It was felt that this budget was a more accurate reflection of production practices in the study area. The sheep sector production coefficients were not modified. Because of price fluctuations, the 1992–2001 average value of production estimates from the Wyoming Agricultural Statistics was used to estimate per animal unit month (AUM) values for both cattle and sheep production. The quantity of production was estimated based on Wyoming Agricultural Statistics data on cattle and sheep inventories by county. Hay production was also adjusted to reflect current production in the study area. Finally, regional purchase coefficients were adjusted to reflect current purchasing patterns in the study area.

Oil and Gas Exploration And Development

The economic impact of oil and gas operations was analyzed in two phases:

- Phase I: Exploration and Development
- Phase II: Production

Phase 1 considered how many exploratory and development wells would be drilled under each alternative in RMPPA, and what percentage of these wells would by completed, including both conventional wells and coalbed natural gas development. Table A35-1 summarizes the economic assumptions used in analyzing the exploration and development phase associated with each alternative. Oil production was considered a byproduct of gas production.

Table A35-1. Economic Assumptions for Gas Exploration and Development

Impacts/Well	Coalbed Natural Gas			Conventional Wells		
	Shallow	Deep	Dual[a]	Intermediate	Dual[b]	Deep
Drilling Cost	$100,000	$250,000	$144,313	$500,000	$625,000	$3,000,000
Completion Cost	$100,000	$250,000	$144,313	$500,000	$625,000	$3,000,000
Drilling Jobs	1.3	3.2	1.8	6.3	7.9	37.9
Completion Jobs	0.6	1.5	0.9	3.0	3.7	18.0
Drilling Earnings	$39,599	$99,220	$57,346	$198,886	$248,496	$1,191,980
Completion Earning	$18,664	$47,329	$27,305	$94,211	$117,876	$565,269
Completion Rate	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Completion Rate—Exploratory	-	-	-	90.0%	-	90.0%

[a]Dual CBNG wells are two wells drilled from the same pad.
[b]Dual intermediate gas are two wells drilled from the same pad.

Phase II considered the economic impact of producing additional gas reserves as a result of the exploration and development under Phase I. Table A35-2 summarizes the economic assumptions used to analyze gas and oil production estimated to occur under each alternative.

Table A35-2. Economic Assumptions for Oil and Gas Production

Inputs/Impacts	Type of Wells	
	Conventional	CBNG
Price/MMCF[a]	$3,250	$3,250
Price/MMBO[a]	$20,500,000	$20,500,000
Labor Earnings	$197.52	$197.52
Employment	0.0052	0.0052

[a] Prices for natural gas and oil were obtained from the Wyoming State Consensus Revenue Estimating Group, October 2003.

The average price of natural gas and oil used for this analysis was obtained from the Wyoming State Government Revenue Forecast for 2004 through 2008. The average price forecast for natural gas for 2004 and beyond was estimated at $3.25 thousand cubic feet ($/mcf) and for oil at $20.50 billion barrels ($/bbl).

Grazing

Grazing activities were analyzed under each alternative as follows. First, BLM was contacted concerning historical grazing use within the RMPPA. The value of grazing AUMs for cattle and sheep was estimated as summarized in Tables A35-3 and A35-4.

Table A35-3. Estimated Value of Cattle AUMs

Year	Value of Production (1,000$s)[a]	Cows that have Calved (1,000 Head)[a]	Value Per Cow	Conversion to AUMs (AUMs/cow)[b]	Value of Production Per AUM Nominal$s	Value of Production Per AUM Real (2001$)
1998	$400,637	880	$455.27	16	$28.45	$30.10
1999	$452,058	830	$544.65	16	$34.04	$35.55
2000	$490,707	830	$591.21	16	$36.95	$37.80
2001	$542,823	850	$638.62	16	$39.91	$39.91
2002	$444,815	820	$542.46	16	$33.90	$33.11
					5-yr Average	**$35.29**

[a] Wyoming Agricultural Statistics

[b] J.P. Workman, *Range Economics*, McMillan Publishing, Inc., New York, 1986.

Table A35-4. Estimated Value of Sheep AUMs

Year	Value of Production (Sheep and Lambs) (1,000$)[a]	Value of Wool Production (1,000$)[a]	Total Value of Production (1,000$)[a]	Ewes 1 Year and Older (1,000 Head)[a]	Value Per Ewe	Conversion to AUMs (AUMs/Ewe)[b]	Value of Production Per AUM Nominal$	Value of Production Per AUM Real 2001$s
1998	$24,493	$4,266	$28,759	430	$66.88	3.2	$20.90	$22.11
1999	$22,489	$2,416	$24,905	385	$64.69	3.2	$20.22	$21.11
2000	$23,448	$2,143	$25,591	365	$70.11	3.2	$21.91	$22.42
2001	$19,155	$2,015	$21,170	340	$62.26	3.2	$19.46	$19.46
2002	$21,412	$2,738	$24,150	320	$75.47	3.2	$23.58	$23.03
							5-yr Average	**$21.63**

[a] Wyoming Agricultural Statistics

[b] J.P. Workman, *Range Economics*, McMillan Publishing, Inc., New York, 1986.

The economic analysis used the 5-year average value of AUMs, or $35.29/AUM for cattle and $21.63 for sheep, in inflation-adjusted dollars. The value and number of AUMs per alternative were then used in combination with the IMPLAN model to estimate economic impacts of grazing under each alternative. The economic assumptions used to analyze grazing impacts are summarized in Table A35-5.

Table A35-5. Economic Assumptions for Grazing.

	Cattle Grazing (2001$)	Sheep Grazing (2001$)
Production Value per AUM	$35.29	$21.63
Total Economic Impact Per AUM	$64.36	$42.36
Earnings Per AUM	$18.77	$5.83
Jobs Per AUM	0.000709	0.000951

Recreation

Recreational impacts were analyzed as follows. The number of recreation visitor days (RVD) was estimated for each alternative, considering several assumptions. These assumptions are summarized in Table A35-6. Once the number of RVDs was estimated by activity, the RVDs were separated into resident and nonresident use and analyzed separately. Residents were considered as any individual living in the four-county study area, whereas nonresidents live outside the four-county region. Residents of the study area associated with big game hunting were determined by evaluating zip codes of hunters that applied for licensees from the Wyoming Game and Fish Department (WGFD) within the relevant hunting areas. Residents and nonresidents participating in off-highway vehicle (OHV) and other dispersed use were based on observations of BLM staff for this area.

The economic impact of recreation in the RMPPA considered activities of nonresidents only. Regional economic impact modeling (Input/Output models) evaluates the additional economic activity associated with "new" money brought into an economy, which can occur as goods and services are produced by local firms and exported to entities outside the region (e.g., agricultural products, oil and gas production). In addition new money can come into an economy as visitors come to the area and spend money. I/O models estimate the additional economic activity that occurs with new money expenditures. Therefore nonresident spending is evaluated when determining the economic impacts of recreation. However this does not imply that recreational activities are not important to the quality of life of residents in the area.

Total annual recreational expenditures of nonresidents were estimated for each alternative using the estimated RVDs per activity and the average expenditures per day per activity. Table A35-7 summarizes the average expenditures used for each activity. The economic assumptions used to estimate recreational impacts are summarized in Table A35-8.

Table A35-6. Recreation Assumptions.

Use Type	Alternative 1	Alternative 2	Alternative 3	Preferred
Nonconsumptive				
OHV	OHV use is estimated to increase 1.5% per year during the planning period, based on current trends in OHV use.	OHV use is expected to increase 3% per year. Increases in OHV use are expected as a result of the creation of the Rawlins OHV SRMA. An increase is also expected in the number of roads and vehicle routes open to OHV use because of changes in wildlife management restrictions and increased mineral development.	OHV use is expected to increase only 1% per year. Although the Rawlins OHV SRMA is expected to increase OHV use, restrictions in other SRMAs, as well as other wildlife restrictions, would reduce the number of roads and vehicle routes open to OHV use.	OHV use is estimated to increase 1.5% per year during the planning period, based on current trends in OHV use.
Other Recreational Uses	Nonconsumptive RVDs are estimated to increase 1.5% per year over the study period, based on current trends.	Nonconsumptive RVDs are expected to decline 1.5% over the study period because of a reduction in, or substantial changes to, wildlife and fisheries habitat in the RMPPA.	Nonconsumptive RVDs are expected to increase by 2.5% per year over the study period as a result of increased protection for wildlife and fisheries resources.	Nonconsumptive RVDs are estimated to increase 1.5% per year over the study period, based on current trends.
Consumptive				
Fishing	Fishing RVDs are expected to increase 2% per year, based on current trends.	Fishing RVDs are expected to stay constant at the 5-year historic average.	Fishing RVDs are expected to increase by 2.5% per year as a result of changes in vegetation management, protection of riparian areas, and protection of wildlife and fish resources.	Fishing RVDs are expected to increase by 2% per year, based on current trends
Elk	Elk hunting is expected to remain constant at the current 5-yr average for the Rawlins RMPPA.	Elk hunting is expected to decline 1% per year during the study period as a result of impacts on wildlife from increased mineral development, changes in vegetation management, and increased OHV use.	Elk hunting is expected to increase as a result of changes in vegetation management, protection of riparian areas, and protection of wildlife habitat, resulting in an increase in RVDs of 0.5% per year.	Elk hunting is expected to remain constant at the current 5-yr average for the Rawlins RMPPA.
Antelope	Antelope hunting is expected to remain constant at the current 5-yr average for the Rawlins RMPPA (or increasing a little).	Antelope hunting is expected to decline 1% per year during the study period as a result of impacts on wildlife from increased mineral development, changes in vegetation management, and increased OHV use.	Antelope hunting opportunities are expected to increase, resulting in an increase in RVDs by 0.5% per year.	Antelope hunting is expected to remain constant at the current 5-yr average for the Rawlins RMPPA (or increasing a little).
Mule and White Tail Deer	Deer hunting is expected to remain constant at the current 5-yr average or decline slightly for the Rawlins RMPPA. Declines would be caused by increased occurrences of chronic wasting disease in	Deer hunting is expected to decline 1% per year during the study period as a result of impacts on wildlife from increased mineral development, changes in vegetation management, and increased OHV use.	Same as Alternative 1.	Same as Alternative 1.

Use Type	Alternative 1	Alternative 2	Alternative 3	Preferred
	the area and loss of sagebrush steppe communities, which hurts winter range availability.			
Water Fowl	Water fowl hunting is expected to remain constant at the current 5-yr average for the Rawlins RMPPA.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

Table A35-7. Summary of Visitor Expenditures.

Summary of Daily Visitor Expenditures	Per Person Per Day
Nonresident OHV Use	119.13[a]
Nonresident Hunting	116.31[b]
Nonresident Other Nonconsumptive Uses	33.27[c]

a Hazen and Sawyer, *Economic Contribution of Off-Highway Vehicle Use in Colorado*, Prepared for the Colorado Off-Highway Vehicle Coalition, Denver, CO, July 2001.
b Morey & Associates, Inc., *Report on the Economic Impact of the Travel Industry in Wyoming—1998*, prepared for the Wyoming Business Council, Division of Tourism, Cheyenne, WY, 1999.
c U.S. Fish & Wildlife Service, *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation—Wyoming*, FHW/01-WY, Rev., 2003.

Table A35-8. Economic Assumptions for Recreation.

	OHV (2001$)	Other Nonconsumptive Uses	Hunting (2001$)
Direct Expenditures	$1,000,000	$1,000,000	$1,000,000
Jobs Per $1M	27.5	31.9	44.3
Earnings Per $1 M	$413,864	$359,448	$436,798

LITERATURE CITED

Minnesota IMPLAN Group (MIG), 2000. IMPLAN Professional, Version 2.0, User's Guide.

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